

## OCONEE COUNTY SHERIFF'S OFFICE RENOVATION

MPS Project No. 017567.01  
Oconee County ITB 17-09  
April 10, 2018

### ADDENDUM NO. 2

The following clarifications, amendments, additions, deletions, revisions, and/or modifications are hereby made a part of the Contract Documents and change the original documents only in the manner and to the extent stated below:

#### **GENERAL**

ITEM No. 1

**Request for Substitutions:**

Requests period closed as of 5:00 PM on April 06, 2018.

**Questions:**

Questions period closed as of 5:00 PM on April 06, 2018.

**Clarification:**

Liquidated damages will not be a provision of the contract for construction.

#### **SPECIFICATIONS**

ITEM No. 1

**Section 00 21 13 Instructions To Bidders**

- Part 1, 1.02 B, C, - Strike through items B and C. Not required in bid.

ITEM No. 2

**Section 02 41 13 - Selective Site Demolition**

- Insert the attached into Bid Documents

ITEM No. 3

**Section 01 35 53 Security Procedures**

- Part 1, 1.02 B - Strike through item B. Not required in bid.

ITEM No. 4

**Section 08 11 13 Hollow Metal Doors and Frames**

- Insert the attached into Bid Documents

ITEM No. 5

**Section 08 14 16 Flush Wood Doors**

- Insert the attached into Bid Documents

- ITEM No. 6      **Section 08 80 00 Glazing**
- Insert the attached into Bid Documents
- ITEM No. 7      **Section 10 51 00 Lockers**
- Insert the attached into Bid Documents
- ITEM No. 8      **Section 31 20 00 - Earth Moving**
- Insert the attached into Bid Documents
- ITEM No. 9      **Section 32 12 16 - Asphalt Paving**
- Insert the attached into Bid Documents
- ITEM No. 10     **Section 32 16 13 - Site Work Concrete**
- Insert the attached into Bid Documents
- ITEM No. 11     **Section 33 11 00 - Potable Water System**
- Insert the attached into Bid Documents

## **DRAWINGS**

- ITEM No. 1      **A040 DEMOLITION PLAN – FIRST FLOOR**
- Clarification: Refer to ABD-01. Stair E-101: Interior wall of stair well to be removed. Touch up remaining stairwell walls as needed. Floors to be sealed concrete. Install new acoustical ceiling and lights with switch on first level.
- ITEM No. 2      **A110 OVERALL PLANS – SECOND FLOOR**
- Clarification: Note J – refers to broken glass units. All currently damaged glazing units to be replaced.
- Reference previous Addenda statement regarding site condition: The Contractors are strongly encouraged to visit the site and do their own investigations prior to submitting bids.
- ITEM No. 3      **A600 MILLWORK**
- Clarification: Shelving to be paint grade and painted, countertop work surface to be high-pressure decorative plastic laminate from full range of colors in solid, solid with core same color as surface and wood grains

ITEM No. 4

**A800 DOORS & STOREFRONT SCH FRAMES & TYPES**

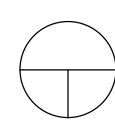
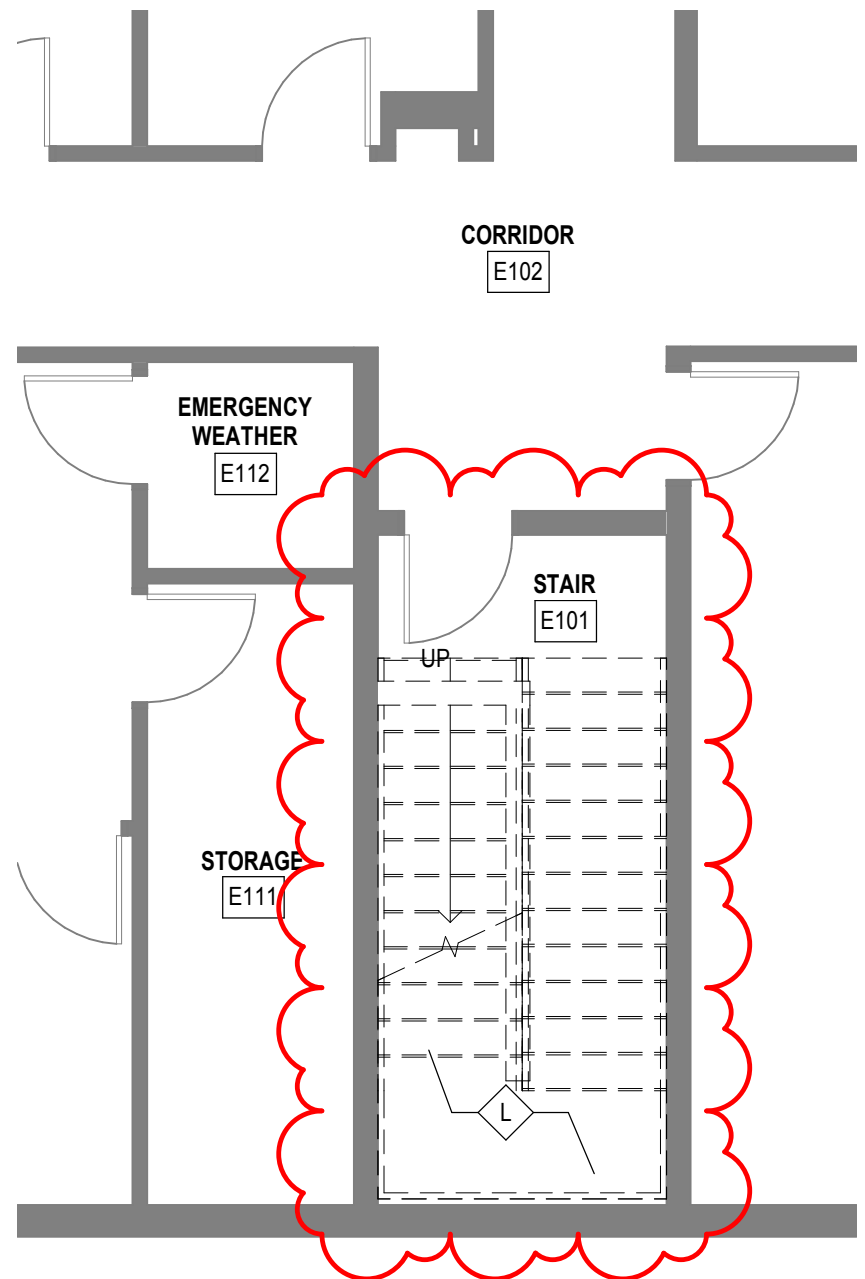
- Revision: Doors 115 and 116 revise frame type to S2
- Revision: Door 113 to be full glass wood door

**End of Addendum No. 2**

**Attachments:**

Current Plan Holder's List	1 page
ABD-01	(1) 11X17 sheet
02 41 13 - Selective Site Demolition	3 pages
08 11 13 - Hollow Metal Doors and Frames	6 pages
08 14 16 - Flush Wood Doors	4 pages
08 80 00 - Glazing	8 pages
10 51 00 - Lockers	2 pages
31 20 00 - Earth Moving	11 pages
32 12 16 - Asphalt Paving	10 pages
32 16 13 - Site Work Concrete	6 pages
33 11 00 - Potable Water System	19 pages

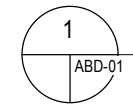
Name	Email Address	Company
Bidder's		
Matthew Bello	matthew.bello@melloul.com	Melloul-Blamey Construction SC Ltd.
Chris Feller	cfeller@isqft.com	ConstructConnect
Karen Ghizzoni	kghizzoni@marshbell.com	Marsh Bell Construction Co. Inc.
Jason Lathrop	jason.lathrop@melloul.com	Melloul-Blamey Construction SC Ltd.
Bonny Mangold	bonny.mangold@construction.com	Dodge Data & Analytics
Lynne Mathis	lmathis@marshbell.com	Marsh/Bell Construction Co., Inc.
Leanna McCall	lmccall@hoganconstructiongroup.com	Hogan Construction Group, LLC
Tripp Ross	tripp@jdavisinc.com	J. Davis Construction Inc.
John Schneider	jschneider@jsheld.com	JS Held LLC



### DEMOLITION KEYNOTES LEGEND

1/4" = 1'-0"

- A** REMOVE EXISTING WALL (SHOWN DASHED)
- B** ALL INTERIOR AREAS U.N.O. PATCH AND SCREED TO RECIEVE NEW FLOOR FINISH. REFER TO FINISH PLAN FOR ADDITIONAL INFO.
- C** REMOVE EXITING PLATFORM SLAB AND PREPARE SURFACE TO RECEIVE NEW FLOOR FINISH
- D** RELOCATE EXISTING DRAIN. REFER TO PLUMBING PLANS
- E** REMOVE ALL EXISTING ACOUSTIC CEILING TILES AND REPLACE.
- F** REMOVE ALUMINUM STOREFRONT & DOOR AS INDICATED ON DRAWINGS. PREPARE OPENING TO RECEIVE NEW STOREFRONT
- G** COORDINATE FURRING AROUND EXISTING VENT PIPE WITH NEW WALL LOCATION
- H** PREPARE OPENING FOR NEW FRAMING.
- I** EXISTING PANEL BOX TO BE ROTATED AND COORDINATED WITH NEW INTERIOR WALL. PANEL TO BE INSIDE THE MECH/ ELEC ROOM.
- J** REMOVE ALL EXISTING DAMAGED ACOUSTIC CEILING TILES AND REPLACE ALL MISSING GRID OPENINGS WITH MATCHING TYPE.
- K** REMOVE ALUMINUM STOREFRONT. PREPARE OPENING TO RECIEVE NEW INFILL WALL.
- L** REMOVE EXISTING STAIR AND INTERIOR WALL. PATCH AND PAINT AS NEEDED. FINISH FLOOR TO BE SEALED CONCRETE. INSTALL NEW ACT CEILING. PROVIDE FOR TWO LIGHT FIXTURES AND SWITCH AT THIS LEVEL.



### FIRST FLOOR PLAN - ABD-01

3/16" = 1'-0"

SHERIFF'S OFFICE RENOVATION

PROJ. NO. 017567.01  
 DATE: 04/10/18  
 REV NO: C  
 REV DESCRIPTION: ADDENDUM #2  
 MODIFIES DTL/SHT: A040

SKETCH NO. **ABD-01**

SECTION 02 41 13  
SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY OF WORK:

- A. This section covers all work associated with the demolition and removal of site features as indicated on the drawings, as specified herein and as otherwise required to accomplish other work associated with the contract.

1.2 SUBMITTALS

- A. None this section.

1.3 REGULATORY REQUIREMENTS

- A. Comply with federal, state, and local demolition, hauling and disposal regulations.

1.4 CRITERIA FOR BIDDING

A. Lump Sum Price

- 1. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for all labor, materials, and equipment necessary to properly demolish and dispose of off-site all facilities shown to be removed on the construction plans and as specified herein including any testing, construction supervision and all other work required for satisfactory completion of site demolition operations. Base bids on the following criteria:
  - a. Explosives shall not be brought to the site.
  - b. Burning will not be allowed.
  - c. Contractor is responsible for permits, fees and licenses.

B. Unit Prices

- 1. None in this Section.

1.5 QUALITY ASSURANCE

- A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.
- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.
- D. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.1 DEMOLITION

- A. Demolish structures completely, safely, and remove from the site using methods required by governing regulations. Small structures may be removed intact when acceptable to the Owner and authorities having jurisdiction.
- B. Proceed with demolition in a systematic manner.
- C. Demolish concrete and masonry in small sections. Break up and remove concrete slabs-on-grade unless otherwise shown to remain.
- D. Demolish and remove below grade construction and concrete slabs on grade to a minimum depth of two feet below proposed subgrade.
- E. Provide full depth saw cuts through all pavements to be removed. Saw cuts shall be neat, straight and vertical.

### 3.2 FILLING BASEMENTS AND VOIDS

- A. Completely fill below grade areas and voids resulting from demolition or removal of structures (underground fuel storage tanks, wells, cisterns, etc.) using approved fill materials as specified in SECTION 312000 "EARTH MOVING".
- B. Ensure that areas to be filled are free of standing water, frost, frozen material, trash and debris prior to fill placement.
- C. Place and compact fill materials as specified by SECTION 312000 "EARTH MOVING".
- D. Grade surface to match adjacent grades and to provide flow to surface drainage structures after fill placements and compaction.

### 3.3 DISPOSAL OF DEMOLISHED MATERIALS

- A. Dispose of demolished materials in accordance with current local, state and federal regulations. All cost in connection with disposing of demolished materials will be the responsibility of the Contractor.
- B. Do not burn any material, debris, or trash on-site.

### 3.4 PROTECTIONS

- A. Ensure safe passage of persons around all areas.
- B. Conduct operations to prevent damage to adjacent buildings, structures, or other facilities, trees, vegetation, or injury to persons, etc.
- C. Promptly repair damages caused to adjacent facilities by demolition operations at no additional cost to the Owner.
- D. Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition and/or relocation operations.
- E. Prevent interruption of existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction.
- F. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities.
- G. Make arrangements, before initiating demolition, for relocating, disconnecting, rerouting, abandoning, or similar action as may be required relative to utilities and other underground piping, to permit work to proceed without delay. Arrangements shall be made in accordance with the regulations of authorities of utilities concerned,

including, but not limited to overhead and underground power and telephone lines and equipment, gas piping, storm sewers, sanitary sewers, or water piping. The Contractor shall not use water when it may create hazardous or objectionable conditions, such as ice, flooding, and/or pollution.

- H. Use water sprinkling and other suitable methods to limit dust and dirt rising and scattering into the air to lowest practical level.
- I. Comply with governing regulations pertaining to environmental protection.

### 3.5 INSPECTIONS

#### A. Inspections

1. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.
2. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours notices for all required observations or tests.

#### B. Acceptance

1. Final acceptance will be based on a satisfactory demolition as approved by the Engineer. Demolition work shall be re-worked to the satisfaction of the Engineer until specified requirements are met. All additional work, which is the result of a failed inspection, shall be performed by the Contractor at no additional cost to the Owner.

**END OF SECTION 02 41 13**



## **SECTION 08 11 13 HOLLOW METAL DOORS AND FRAMES**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Thermally insulated hollow metal doors with frames.
- E. Security resistant hollow metal doors and frames.
- F. Accessories.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 08 71 00 - Door Hardware.
- B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.
- C. Section 09 91 13 - Exterior Painting: Field painting.
- D. Section 09 91 23 - Interior Painting: Field painting.

#### **1.03 REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2003 (R2009).
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015, with Editorial Revision (2016).
- G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.
- H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2017.
- I. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
- J. ICC (IBC) - International Building Code; 2015.

- K. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- L. ITS (DIR) - Directory of Listed Products; current edition.
- M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- O. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.
- P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2006.
- Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- R. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.
- S. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.
- T. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.
- U. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

#### **1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements, including wind-borne debris requirements.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- B. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: [www.steeldoor.org/sdicertified.php](http://www.steeldoor.org/sdicertified.php).
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.
- D. Maintain at project site copies of reference standards relating to installation of products specified.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Hollow Metal Door Assemblies; includes doors, frames, glazing and hardware.
  - 1. Ceco Door, an Assa Abloy Group company: [www.assaabloydss.com](http://www.assaabloydss.com).
  - 2. Curries, an Assa Abloy Group company: [www.assaabloydss.com](http://www.assaabloydss.com).
  - 3. Republic Doors: [www.republicdoor.com](http://www.republicdoor.com).
  - 4. Steelcraft, an Allegion brand: [www.allegion.com/sle](http://www.allegion.com/sle).
  - 5. Substitutions: See Section 01 25 00 - Substitution Procedures.

### **2.02 DESIGN CRITERIA**

- A. Requirements for Hollow Metal Doors and Frames:
  - 1. Door, frame, glazing and hardware assembly meeting ICC (IBC) requirements for glazed, single commercial doors in wind-borne debris regions.
  - 2. Steel used for fabrication of door and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
  - 3. Accessibility: Comply with ICC A117.1 and ADA Standards.
  - 4. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
  - 5. Door Edge Profile: Manufacturers standard for application indicated.
  - 6. Typical Door Face Sheets: Flush.
  - 7. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
  - 8. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
  - 9. Zinc Coating for Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    - a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) for interior applications, and at least A60/ZF180 (galvannealed) for corrosive and exterior locations.
- B. Hollow Metal Panels: Same construction, performance, and finish as doors.
- C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

## 2.03 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated.
  - 1. Grade and Level: ANSI/SDI A250.8 (SDI-100); Level 3 - Extra Heavy-Duty, Physical Performance Level A, Model 2 - Seamless.
    - a. Level 1 - Standard-duty.
  - 2. Core: Polystyrene.
  - 3. Door Thermal Resistance: R-Value of 6.0 minimum, for installed thickness of polystyrene.
  - 4. Door Thickness: 1-3/4 inch, nominal.
  - 5. Weatherstripping: Refer to Section 08 71 00.
- B. Interior Doors, Non-Fire Rated:
  - 1. Grade: ANSI/SDI A250.8 (SDI-100); Level 3 - Extra Heavy-Duty, Physical Performance Level A, Model 2 - Seamless.
  - 2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
  - 3. Door Thickness: 1-3/4 inch, nominal.
- C. Fire-Rated Doors:
  - 1. Grade: ANSI/SDI A250.8 (SDI-100); Level 2 - Heavy-Duty, Physical Performance Level B, Model 2 - Seamless.
    - a. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    - b. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.
  - 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
    - a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
    - b. Attach fire rating label to each fire rated unit.
  - 3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
  - 4. Door Thickness: 1-3/4 inch, nominal.

## 2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Door Frames: Fully welded type.
  - 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
  - 2. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
  - 3. Frame Finish: Factory primed and field finished.
  - 4. Weatherstripping: Integral, recessed into frame edge.
- C. Interior Door Frames, Non-Fire-Rated: Fully welded type.
  - 1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
  - 2. Frame Finish: Factory primed and field finished.
- D. Interior Door Frames, Fire-Rated: Fully welded type.
  - 1. Fire Rating: Same as door, labeled.

2. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
  3. Frame Finish: Factory primed and field finished.
- E. Security Resistant Door Frames: With same security resistance as door; face welded or full profile/continuously welded construction, ground smooth, fully prepared and reinforced for hardware installation.
1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
  2. Frame Finish: Factory primed and field finished.
- F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- G. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high to fill opening without cutting masonry units.

## **2.05 FINISHES**

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

## **2.06 ACCESSORIES**

- A. Glazing: As specified in Section 08 80 00, factory installed.
- B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered corners; prepared for countersink style tamper proof screws.
- C. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.
- D. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.
- E. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

### **3.02 PREPARATION**

- A. Coat inside of frames to be installed in masonry, concrete or to be grouted, with bituminous coating, prior to installation.

### **3.03 INSTALLATION**

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Install door hardware as specified in Section 08 71 00.
  - 1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.
- F. Comply with glazing installation requirements of Section 08 80 00.
- G. Coordinate installation of electrical connections to electrical hardware items.

### **3.04 TOLERANCES**

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

### **3.05 ADJUSTING**

- A. Adjust for smooth and balanced door movement.

**END OF SECTION**

**SECTION 08 14 16**  
**FLUSH WOOD DOORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Flush wood doors; flush configuration; fire-rated and non-rated.

**1.02 RELATED REQUIREMENTS**

- A. Section 08 11 13 - Hollow Metal Doors and Frames: Hollow metal frames for flush wood doors.
- B. Section 08 71 00 - Door Hardware.
- C. Section 08 80 00 - Glazing.
- D. Section 09 91 23 - Interior Painting: Field finishing of doors.

**1.03 REFERENCE STANDARDS**

- A. AWI (QCP) - Quality Certification Program; current edition at [www.awiqcp.org](http://www.awiqcp.org).
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.
- D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- E. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors, frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing, and other details
  - 1. Provide information as required by AWI/AWMAC/WI (AWS).
- D. Samples for Initial Selection: For factory-finished doors.
- E. Samples: Door veneer samples, 8 by 10 inches in size, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in finished Work.
- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- G. Manufacturer's Installation Instructions: Indicate special installation instructions.
- H. Warranty, executed in Owner's name.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than five years of documented experience.

1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- C. Quality Certification:
  1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: [www.awiqcp.org/#sle](http://www.awiqcp.org/#sle).
  2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
  3. Provide designated labels on shop drawings as required by certification program.
  4. Provide designated labels on installed products as required by certification program.
  5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

#### **1.07 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Wood Veneer Faced Doors:
  1. Basis of Design: VT Industries Architectural Wood Doors: [www.VTDoors.com](http://www.VTDoors.com)
    - a. Species, Cut, Stain: Plain sliced, Select White Birch, Onyx, ON15 (Standard Stain)
  2. Other Manufacturers: Provide either the product identified as "Basis of Design" submit or a substitution request for one of the manufacturers listed below:
    - a. Eggers Industries: [www.eggersindustries.com](http://www.eggersindustries.com).
  3. Graham Wood Doors: [www.grahamdoors.com](http://www.grahamdoors.com).
  4. Marshfield DoorSystems, Inc; \_\_\_\_: [www.marshfielddoors.com](http://www.marshfielddoors.com).
  5. Substitutions: See Section 01 25 00 - Substitution Requirements.



## 2.02 DOORS AND PANELS

- A. Doors: Refer to drawings for locations and additional requirements.
  - 1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
  - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
  - 1. Provide solid core doors at each location.

## 2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core: Type particleboard core (PC), plies and faces as indicated.
- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

## 2.04 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: Species to be determined later, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
  - 1. Vertical Edges: Any option allowed by quality standard for grade.
  - 2. "Running Match" each pair of doors and doors in close proximity to each other.
  - 3. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.
  - 4. Transoms: Continuous match to doors.

## 2.05 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
  - 1. Provide solid blocks at lock edge for hardware reinforcement.
  - 2. Provide solid blocking for other throughbolted hardware.
- C. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.
- D. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- E. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- G. Provide edge clearances in accordance with the quality standard specified.

## 2.06 FACTORY FINISHING/REFINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
  - 1. Transparent:
    - a. System - TR-8, UV Cured Acrylated Polyester/Urethane.

- b. Stain: As selected by Architect from supplier's full range.
- c. Sheen: Satin.
- B. Contractor's option to supply new or refinish existing doors as indicated.
- C. Factory finish OR refinish doors in accordance with approved sample.
- D. Seal door top edge with color sealer to match door facing.

## **2.07 ACCESSORIES**

- A. Hollow Metal Door Frames: As specified in Section 08 11 13.
- B. Glazing: As specified in Section 08 80 00.
- C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
  - 1. Wood with metal clips for rated doors.
- D. Door Hardware: As specified in Section 08 71 00.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

### **3.02 INSTALLATION**

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
  - 1. Install fire-rated doors in accordance with NFPA 80 requirements.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.
- F. Install door louvers plumb and level.

### **3.03 TOLERANCES**

- A. Conform to specified quality standard for fit and clearance tolerances.
- B. Conform to specified quality standard for telegraphing, warp, and squareness.

### **3.04 ADJUSTING**

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

**END OF SECTION**

## SECTION 08 80 00

### GLAZING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing accessories.

##### 1.02 RELATED REQUIREMENTS

- A. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
- B. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.
- C. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly and aluminum entrance doors.

##### 1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.
- C. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).
- E. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.
- H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.
- J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
- K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- L. CPSC 16 CFR Part 1201 - Safety Standard for Architectural Glazing Material; 2002.
- M. GANA (GM) - GANA Glazing Manual; 2009.
- N. GANA (SM) - GANA Sealant Manual; 2008.
- O. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

- P. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2004).
- Q. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2014.
- R. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014.
- S. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2014.

#### **1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

#### **1.05 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
- D. Samples: Submit two samples 12 by 12 inch minimum of glass units, showing coloration and design.
- E. Manufacturer's Certificate: Certification that exterior products meet or exceed specified requirements including applicable requirements of indicated in Section 01 40 00 - Regulatory Requirements.
- F. Certificate: Certify that products of this section meet or exceed specified requirements.
- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### **1.06 QUALITY ASSURANCE**

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

#### **1.07 MOCK-UPS**

- A. See Section 01 40 00 - Quality Requirements, for additional mock-up requirements.
- B. Provide on-site glazing mock-up with the specified glazing components.

- C. Locate where directed.
- D. Mock-ups may remain as part of the Work.

#### **1.08 FIELD CONDITIONS**

- A. Do not install glazing when ambient temperature is less than 40 degrees F.

#### **1.09 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- C. Laminated Glass: Provide a five year manufacturer warranty to include coverage for delamination, including replacement of failed units.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Glass Fabricators:
  - 1. GGI - General Glass International: [www.generalglass.com/#sle](http://www.generalglass.com/#sle).
  - 2. Trulite Glass & Aluminum Solutions, LLC: [www.trulite.com](http://www.trulite.com).
  - 3. Substitutions: Refer to Section 01 60 00 - Product Requirements.
- B. Float Glass Manufacturers:
  - 1. Vitro Architectural Glass (formerly PPG Glass); Solarban 90: [www.vitroglazings.com/#sle](http://www.vitroglazings.com/#sle).
  - 2. TBD.
  - 3. Substitutions Procedures: Refer to Section 01 60 00 - Product Requirements.
- C. Laminated Glass Manufacturers:
  - 1. Cardinal Glass Industries: [www.cardinalcorp.com](http://www.cardinalcorp.com).
  - 2. Viracon, Architectural Glass segment of Apogee Enterprises, Inc: [www.viracon.com](http://www.viracon.com).
  - 3. Substitutions: Refer to Section 01 60 00 - Product Requirements.

#### **2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES**

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
  - 1. Design Pressure: Calculated in accordance with ASCE 7.
  - 2. Design Performance Criteria: Provide exterior glazing meeting design performance requirements of wind pressures and windborne-debris-impact resistance. See Section 01 41 00 - Regulatory Requirements.
  - 3. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
  - 4. Seismic Loads: Design and size glazing components to withstand seismic loads and sway displacement in accordance with the requirements of ASCE 7.
    - a. Refer to Section 01 41 00 for project specific seismic design performance criteria.

5. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
  6. Glass thicknesses listed are minimum. Provide greater thickness as required for exterior wind load design including wind-borne debris region requirements.
- B. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
  2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
  3. Solar Optical Properties: Comply with NFRC 300 test method.

### 2.03 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless noted otherwise.
1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
  2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and FT.
  3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 and CPSC 16 CFR Part 1201 criteria.
  4. Impact Resistant Safety Glass: Complies with ANSI Z97.1 and CPSC 16 CFR Part 1201 criteria; Class B/Category I.
  5. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality-Q3, color and performance characteristics as indicated.
  6. Thicknesses: Glass thicknesses indicated are minimum; provide greater thickness as required for exterior glazing wind load design.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
1. Laminated Safety Glass: Complies with ANSI Z97.1 and CPSC 16 CFR Part 1201 test requirements for Category II.
  2. Ionoplast Interlayer: 0.090 inch thick, minimum.

### 2.04 INSULATING GLASS UNITS

- A. Manufacturers:
1. Any of the manufacturers specified for float glass.
  2. Fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
  3. [www.ppgideasapes.com/#sle](http://www.ppgideasapes.com/#sle). Vitro Architectural Glass (formerly PPG Glass); Solarban 90: [www.vitroglazings.com/#sle](http://www.vitroglazings.com/#sle).
  4. Substitutions: Refer to Section 01 60 00 - Product Requirements.
- B. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.

2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
  3. Metal Edge Spacers: Aluminum, bent and soldered corners.
  4. Spacer Color: Black.
  5. Edge Seal:
    - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
  6. Color: Black.
  7. Purge interpane space with dry air, hermetically sealed.
  8. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
    - a. Capillary Tubes: Tubes to remain open and be of length and material type in accordance with insulating glass fabricator's requirements.
    - b. Inert gas may be installed in the field into air space in accordance with insulating glass fabricator's and installer's requirements.
- C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Space between lites filled with argon.
  2. Outboard Lite: Heat-strengthened but fully tempered where indicated or required by applicable code and design requirements., 1/4 inch thick, minimum.
    - a. Tint: Clear.
  3. Inboard Lite: Same glass type as exterior lite, 1/4 inch thick, minimum.
    - a. Tint: Clear.
  4. Total Thickness: 1 inch
  5. Thermal Transmittance (U-Value), Summer - Center of Glass: \_\_\_\_\_, nominal.
  6. Visible Light Transmittance (VLT): 54% percent, nominal.
  7. Solar Heat Gain Coefficient (SHGC): 0.24, nominal.

## **2.05 BASIS OF DESIGN - INSULATING GLASS UNITS**

- A. Basis of Design Insulating Glass Units: Vision glazing, with low-E coating.
1. Applications: Exterior insulating glass glazing unless otherwise indicated.
  2. Space between lites filled with argon.
  3. Total Thickness: 1-5/16 inch.
  4. Basis of Design - Vitro Architectural Glass (formerly PPG Glass):  
[www.vitroglazings.com/#sle](http://www.vitroglazings.com/#sle).
  5. Outboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum; except fully-tempered where indicated or required by code.
    - a. Low-E Coating: PPG Solarban 90 on #2 surface.
    - b. Glass: Starphire (Ultra Clear).

6. Inboard Lite: Heat-strengthened float glass, 1/4 inch for non-impact resistant glazing; for impact-resistant glazing, provide two layers of 1/4" heat-strengthened float glass and clear polyvinyl butyral interlayer.
  - a. Coating: No coating on inboard lite.
  - b. Glass: Starphire (Ultra Clear).

## **2.06 BASIS OF DESIGN - MONOLITHIC GLAZING UNITS**

- A. Type G-1 - Monolithic Safety Glazing:
  1. Applications:
    - a. Glazed lites in doors.
    - b. Glazed sidelights to doors.
    - c. Other locations required by applicable federal, state, and local codes and regulations.
    - d. Other locations indicated on drawings.
  2. Glass Type: Fully tempered safety glass as specified.
  3. Tint: Clear.
  4. Thickness: 1/4 inch, nominal.

## **2.07 ACCESSORIES**

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

## **PART 3 EXECUTION**

### **3.01 VERIFICATION OF CONDITIONS**

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.



- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

### **3.03 INSTALLATION, GENERAL**

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

### **3.04 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

### **3.05 CLEANING**

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove non-permanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

### **3.06 PROTECTION**

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

**END OF SECTION**



## SECTION 10 51 00

### LOCKERS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Solid plastic lockers.

##### 1.02 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.
- B. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

##### 1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.
- C. Shop Drawings: Indicate locker plan layout, numbering plan.
- D. Samples: Submit two samples 3 by 6 inches in size, of each color scheduled.

##### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect locker finish and adjacent surfaces from damage.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Solid Plastic Lockers:
  - 1. Columbia Lockers, a division of PSiSC; PolyLife Lockers: [www.columbialockers.com](http://www.columbialockers.com).
  - 2. Scranton Products; Tufftec Lockers: [www.scrantonproducts.com](http://www.scrantonproducts.com)
  - 3. ASI Group; Plastic Lockers; [www.asistorage.com](http://www.asistorage.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.

##### 2.02 LOCKER APPLICATIONS

- A. Wardrobe Lockers: Single tier solid plastic (HDPE) lockers, wall mounted with base.
  - 1. Width: 15 inches.
  - 2. Depth: 15 inches.
  - 3. Height: 72 inches.
  - 4. Fittings: Hat shelf, 2 coat hooks.
  - 5. Locking: Padlock hasps, for padlocks provided by Owner.
  - 6. Provide sloped top.

##### 2.03 SOLID PLASTIC LOCKERS

- A. Lockers: Factory assembled, made of high density polyethylene (HDPE) panels, tested in accordance with NFPA 286, homogenous color throughout, with mortise and tenon joints with stainless steel fasteners or heat fused joints.

1. Doors: Full overlay without frame.
  2. Where locker ends or sides are exposed, provide same finish as fronts or provide extra panels to match fronts.
  3. Ventilation: By horizontal slots at the top and bottom of door.
  4. Provide filler strips where indicated, securely attached to lockers.
  5. Door and body color: To be selected by Architect.
- B. Component Thicknesses:
1. Doors: 1/2 inch minimum thickness.
  2. Locker Body: Tops, bottoms, backs, and shelves 3/8 inch minimum.
  3. End Panels and Filler Panels: 1/2 inch minimum thickness.
  4. Sloped Tops: 1/2 inch minimum thickness.
  5. Toe Kick Plates: 1/2 inch minimum thickness.
- C. Solid Plastic Panels: High Density polyethylene (HDPE) formed under high pressure into solid plastic components.
1. Surface Burning Characteristics: Flame spread index of 75 or less, and smoke developed index of 450 or less; when tested in accordance with ASTM E84.
- D. Hinges: Full height of locker, manufacturer's standard heavy duty type.
- E. Coat Hooks: Stainless steel; attached with tamperproof screws.
- F. Number Plates: Provide rectangular shaped aluminum plates. Form numbers \_\_\_\_ inch high of block font style with ADA designation, in contrasting color.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that prepared bases are in correct position and configuration.
- B. Verify bases and embedded anchors are properly sized.

#### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install lockers plumb and square.
- C. Place and secure on prepared base.
- D. Secure lockers with anchor devices to suit substrate materials. Minimum Pullout Force: 100 lb.
- E. Bolt adjoining locker units together to provide rigid installation.
- F. Install end panels, filler panels, and sloped tops.
- G. Install accessories.
- H. Replace components that do not operate smoothly.

#### **3.03 CLEANING**

- A. Clean locker interiors and exterior surfaces.

**END OF SECTION**

SECTION 31 20 00  
EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers all work associated with stripping, subgrade preparation, filling, backfilling, compaction and disposition of surplus soil materials.

1.2 DEFINITIONS

- A. Subgrade: Existing, in-situ soil or other material that is remaining after stripping or excavation. The subgrade is always existing material on which fill, or new structures are to be placed.
- B. Excavation: The removal of soil or material to obtain a specified depth or elevation.
- C. Borrow: Material that must be transported to the site. A material that must be developed by others and transported to the site. Not available on site.
- D. Fill: Soil or material placed above the subgrade to the point of new construction such as a sub-base, base course, pavement, foundation, footing, or building component.
- E. Backfill: Fill material used in refilling a cut, trench or other excavation.
- F. Lift: A layer or course of material placed on top of a previously prepared or placed material.
- G. Rock: Solid, homogeneous interlocking crystalline material with firmly cemented, laminated or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe mounted pneumatic hole punchers or rock breakers; also, large boulders, buried masonry, or concrete other than pavement, exceeding 25 cubic yards in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.
- H. Topsoil: In natural or undisturbed soil formations, the fine grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Topsoil may be dark-colored, fine, silty or sandy material with a high content of well decomposed organic matter, often containing traces of the parent rock material. The material shall be representative of productive soils in the vicinity.
- I. Unsuitable Material: Existing, in situ soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability. Materials classified as PT, OH, or OL by ASTM D 2487 are unsuitable. Unsuitable materials also include man-made fills, refuse, frozen material, uncompacted backfills from previous construction, unsound rock or soil lenses, or other deleterious or objectionable material.
- J. Granular Material: Soils classified as GW, GP, SW or SP by ASTM D 2487. Materials classified as GM and SM will be identified as granular only when fines have a plasticity index of zero.
- K. Compaction: The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D 1557 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated

cohesionless materials, abbreviated in this specification as “ \_\_\_ percent maximum density.”

### 1.3 SUBMITTALS

#### A. Plans

1. Dewatering Plan: Describe methods for removing collected water from open trenches and diverting surface water or piped flow away from work area. Describe equipment and procedures for installing and operating the dewatering system indicated. Describe the basic components of the dewatering system proposed for use and its planned method of operation. Record performance and effectiveness of method or system in use. The dewatering plan shall address, as a minimum, the requirements identified in the paragraph titled “Drainage and Dewatering”
2. Shoring and Sheet piling Plan: Describe the materials of the shoring system to be used. Indicate whether or not components will remain after filling or backfilling. Provide plans, sketches, or details along with calculations by a professional engineer. Indicate sequence and method of installation and removal.

#### B. Certifications

1. Independent Laboratory
2. Material Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for the following:
  - a. Topsoil
  - b. Gravel
  - c. Sand

#### C. Laboratory Testing: Submit testing data as identified in the paragraph titled “Laboratory Testing” for any of the following materials to be used on the project. Obtain approval before any material is delivered to the site.

1. Subgrade
2. Common fill
3. Controlled fill
4. Granular fill

#### D. Field Testing: Submit field testing data as identified in the paragraph titled “Field Testing” for the following:

1. Subgrade compaction & density
2. Excavation compaction & density
3. Fill/backfill compaction & density

### 1.4 DELIVERY, STORAGE AND HANDLING

- #### A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

### 1.5 REGULATORY REQUIREMENTS

- #### A. Materials and workmanship specified herein with reference to SC DOT State Standards shall be in accordance with the referenced article or section of the standard except that contractual and payment provisions do not apply. Where the term “State” is used, it shall mean “Owner.”
- #### B. Comply with federal, state, and local regulations.

## 1.6 CRITERIA FOR BIDDING

- A. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for the removing and replacing of topsoil and all excavating, filling, transporting of material, compaction, shaping, finishing, dressing, disposal of surplus material, testing, staking, construction supervision and all other work required for satisfactory completion of the grading operation. The building pad shall include all areas to 10' outside the building wall and the area under all footings including trench walls and bottom. Also included in this price shall be that necessary to complete the grubbing and root raking operation as required by this section and elsewhere.
- B. Unit Prices
  - 1. None in this section.

## 1.7 QUALITY ASSURANCE

- A. Materials: The Contractor will furnish the Engineer and Owner a description of all materials before ordering. The Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.
- D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- E. Testing Agencies: Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test. Agencies to be used shall be submitted to the Engineer for review prior to engagement.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. Provide materials free from debris, roots, wood, scrap materials, vegetable matter, refuse or frozen material. Maximum particle size permitted is 3 inches. Use excavated material from the site for the work indicated when material falls within the requirements specified herein. When materials available on site do not meet the quantity required nor the requirements specified herein, the Contractor shall obtain borrow materials from off-site.
  - 1. Common Fill: Provide a soil material from the site or borrow that can be readily compacted to the specified densities. Materials shall be unclassified. Soft, spongy, highly plastic, or otherwise unsuitable material is prohibited. Material

- shall be unclassified but shall contain sufficient fines to ensure proper compaction.
2. **Controlled Fill:** Provide materials classified as GW, GP, GC, SW, SP, SM or SC by ASTM D 2487 where indicated. The liquid limit of such material shall not exceed 35 percent when tested in accordance with ASTM D 4318. The plasticity index shall not be greater than 12 percent when tested in accordance with ASTM D 4318, and not more than 35 percent by weight shall be finer than the No. 200 sieve when tested in accordance with ASTM D 1140
  3. **Granular Fill:** A dense, well graded aggregate mixture of sand, gravel or crushed stone mixed individually, in combination with each other, or with suitable binder soil. Granular fill may also consist of poorly graded sands or gravels.
  4. **Gravel:** Clean, coarsely graded natural gravel, crushed stone or a combination thereof classified as GW or GP in accordance with ASTM D 2487 as indicated. The maximum particle size shall not exceed 3 inches
  5. **Sand:** Clean, coarse-grained sand classified as SW or SP by ASTM D 2487 as indicated.
  6. **Topsoil:** Salvaged topsoil from stockpile created during stripping operations. Add necessary soil modifiers to bring material within the ranges specified in Table 1. Furnish additional topsoil meeting the requirements in Table 1 if stockpiled material is insufficient to complete the work indicated.
  7. Soil materials shall be free of subsoil, stumps, roots larger than ¾ inch in diameter (with maximum 3 percent retained on the ¼ inch sieve, brush, weeds, toxic substances, and other material or substance detrimental to plant growth.

**TABLE 1**

<b>DOA SSIR Soil Survey Investigation Report No. 1, Laboratory Test for</b>	<b>Acceptable Limits</b>
Sand Content	20 - 45 percent by weight
Silty Content	25 - 50 percent by weight
Clay Content	10 - 30 percent by weight
Organic Material (Walkley-Block)	5 percent
Ph	5.0 to 7.6
Soluble Salts	600 ppm maximum
Absorption Rate	0.5 inch per hour minimum

2.2 **GEOTEXTILE FABRICS**

A. **Filter Fabric**

1. Provide a pervious sheet of polyester, nylon, glass or polypropylene, ultraviolet resistant filaments woven, spun bonded, fused, or otherwise manufactured into a nonraveling fabric with uniform thickness and strength. Fabric shall have the following manufacturer certified minimum average roll properties as determined by ASTM D4759:

**TABLE 2: Minimum Average Roll Properties**

	<b>Class A</b>	<b>Class B</b>
Grab Tensile Strength ASTM D 4632 Machine and Transversed Direction	min. 180	80 lbs
Grab Elongation ASTM D 4632 Machine and Transverse Direction	min. 15	15 percent



Puncture Resistance ASTM D 4833	min. 80	25 lbs.
Mullen Burst Strength ASTM D 3786	min. 290	130 psi
Trapezoidal Tear ASTM D 4533	min. 50	25 lbs
Apparent Opening Size:	See Criteria Below	
Soil with 50 percent or less particles by weight passing US No. 200 Sieve, AOS less than 0.6 mm (greater than #30 US Std. Sieve)		
Soil with more than 50 percent particles by weight passing US No. 200 Sieve, AOS less than 0.297 mm (greater than #50 US Std. Sieve)		
Permeability ASTM D 4491	k fabric greater than k Soil	
Ultraviolet Degradation ASTM D 4355	70 percent Strength	Retained at 150 hrs

**PART 3 - EXECUTION**

**3.1 STRIPPING**

- A. Perform clearing and grubbing operations as specified in Section "SITE CLEARING".
- B. Strip topsoil from the site where excavation or grading is indicated and stockpile separately from other excavated material. Material unsuitable for use as topsoil may be used for common fill provided that those requirements are met. Locate topsoil so that material can be used readily for the finished grading. Protect and store in segregated piles until needed.

**3.2 EXCAVATIONS**

- A. Excavate to contours and dimensions indicated. Keep excavations free from water while construction is in progress. Notify the Engineer immediately in writing in the event that it becomes necessary to remove rock, hard material, or other material defined as unsuitable to a depth greater than indicated. Refill excavations cut below the depths indicated with controlled fill and compact as specified herein. Excavate soil disturbed or weakened by construction operations or soils softened from exposure to weather. Refill with controlled fill or concrete and compact as specified herein.
- B. Excavations for Structures and Spread Footings
  - 1. Excavate to depth indicated. If excavation is deeper than indicated, then fill with concrete when the foundations or footings are placed or backfill with controlled fill material prior to placement of footings.
- C. Pile Supported Foundations
  - 1. Excavate to elevation of bottom of pile cap. Backfill and compact over excavations and changes in grade due to pile driving operations in accordance with the requirements for filling and backfilling for structures. Place and compact backfill adjacent to pile caps in a manner that prevents displacement of the pile cap.
- D. Disposal of Excavated Material
  - 1. Surplus or other soil material not required or suitable for filling, backfilling, or embankment shall be removed from the property. Comply with all federal, state and local laws regarding the transportation and disposal of such material.
  - 2. Dispose of excavated material in such a manner that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of facilities, or be detrimental to any property or work.

**3.3 PREPARATION OF SUBGRADE**

- A. Subgrade Proof Rolling

1. After removal of topsoil or other overburden, proof roll the existing subgrade with six passes of a minimum 15 ton pneumatic-tired roller. Operate the roller in a systematic manner to assure the number of passes over all areas, and at speeds between 2.5 and 3.5 miles per hour.
2. When proof rolling under structures, one-half of the passes made with the roller shall be in a direction perpendicular to the other passes.
3. Rutting or pumping shall indicate unsuitable material and that material shall be undercut as directed by the Engineer, to a depth of 24 inches, and replaced with the appropriate fill material. Unsuitable material removal shall be done in accordance with the paragraph titled "Excavations."
4. Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades. Materials degraded by proof rolling a wet or saturated subgrade shall be replaced by the Contractor as directed by the Engineer at no cost to the Owner.
5. Proof rolling shall be done in the presence of the Engineer. Notify the Engineer 3 days prior to proof rolling.

**B. Preparation of Subgrade**

1. Scarify the underlying subgrade surface to a depth of 6 inches before the fill is started. Step, bench, or break up sloped surfaces steeper than one vertical to 4 horizontal so that the fill material will bond with or be securely keyed to the existing material. Scarify existing surface to a minimum depth of 6 inches if subgrade density is less than the degree of compaction specified and recompact.
2. When the subgrade is part fill and part excavation or natural ground, scarify the excavated or natural ground portion to a depth of 12 inches and recompact as specified for the adjacent or overlying fill. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.

**C. Compaction of Subgrade**

1. The subgrades shall be compacted to the following maximum densities:

Location	Percent Maximum Density
Under sidewalks and grassed areas	90
Under building slabs, foundations, footings, pavements and base courses (Greater than 12 inches below bottom of structure or pavement)	95
Under building slabs, foundations, footings, pavements and base courses (Less than 12 inches below the bottom of structure or pavement)	98

2. Protect subgrade from excessive wheel loading during construction, including concrete trucks and dump trucks.
3. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of a material equal to or better than best subgrade material on site.
4. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross section. Maintain subgrade for area to be paved and building pad subgrade, whether previously graded by others and accepted by

Contractor or constructed by Contractor. Make adjustments that may be required in accordance with the Specifications at no additional expense to the Owner.

D. Tolerances

1. Grade to finished grades indicated within 0.10 foot. Grade area to drain water away from structures. Existing grades which are to remain but are disturbed by the Contractor's operations shall be restored to original condition.
2. Finish surface of subgrade to the elevation and cross section indicated. Finished surface shall be smooth and of uniform texture. Lightly scarify or blade the finished surface to bring the finished surface to within 0.10 foot of the indicated grade and to eliminate imprints made by compaction and shaping equipment. Surface shall show no deviations in excess of ½ inch when tested with a 10-foot straightedge.
3. Finished subgrade shall be verified to ensure proper elevation for construction above subgrade. Grading of building and pavement areas shall be checked by string line from grade stakes (blue tops) set at not more than 50' centers. Contractor is to provide engineering and field staking necessary for verification of lines, grades, and elevations.

3.4 FILL AND BACKFILL

- A. Place required fill and backfill material adjacent to structures and compact in a manner that prevents wedging action or eccentric loading upon or against the structures.
- B. Step or serrate slopes bounding or within areas to be filled or backfilled to prevent sliding of the fill.
- C. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction and slopes with the equipment used. Do not place material on surfaces that are muddy, frozen, or contain frost.
- D. Do not use equipment for filling or backfilling operations or for the formation of embankments against structures that will overload the structure. Filling or backfilling against structures will be done only after the structure has attained sufficient strength to withstand the loads anticipated during and after backfilling operations.
- E. Fill and backfill operations shall be performed with the following materials:
  1. Common Fill
    - a. Construct fill, backfill and embankment at the locations and to lines and grades indicated. Use only approved materials in constructing fill on the prepared subgrade. Place satisfactory material in horizontal lifts not exceeding 8 inches in loose depth. Do not place material on surfaces that are muddy, frozen, or contain frost. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction and slopes with the equipment used. Compact each lift as specified before placing the overlaying lift.
  2. Controlled Fill
    - a. Place controlled fill under footings, concrete slabs not pile supported, structures, pavements and where indicated in maximum loose lifts of 8 inches. Do not place material on surfaces that are muddy, frozen, or contain frost. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction and slopes with the

equipment used. Compact each lift as specified herein before placing the overlaying lift. Compaction shall be accomplished continuously over the entire area. Sufficient passes shall be made to ensure that specified density is obtained.

3. Granular Fill, Gravel and Sand
  - a. Granular fill, gravel and sand shall be placed where indicated. Do not dump material, but place in maximum loose 12-inch lifts and compact as indicated.

F. Compaction of Fill/Backfill

1. Fill and backfill shall be compacted to the following maximum densities:

Location	Percent Maximum Density
Under sidewalks and grassed areas	90
Under building slabs, foundations, footings, pavements and base courses (Greater than 12 inches below bottom of structure or pavement)	95
Under building slabs, foundations, footings, pavements and base courses (Less than 12 inches below the bottom of structure or pavement)	98

2. Protect compacted fill from excessive wheel loading during construction, including concrete trucks and dump trucks. Remove areas of compacted fill found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of a material meeting the specifications. Surface of compacted fill after compaction shall be hard, uniform, smooth, stable, and true to grade and cross section. Maintain compacted fill for area to be paved and building pad subgrade, whether previously graded by others and accepted by Contractor or constructed by Contractor. Make adjustments that may be required in accordance with the Specifications at no additional expense to the Owner.

G. Tolerances

1. Grade to finished grades indicated within 0.10 foot. Grade area to drain water away from structures. Existing grades which are to remain but are disturbed by the Contractor's operations shall be restored to original condition.
2. Finish surface of fill or backfill to the elevation and cross section indicated. Finished surface shall be smooth and of uniform texture. Lightly scarify or blade the finished surface to bring the finished surface to within 0.10 foot of the indicated grade and to eliminate imprints made by compaction and shaping equipment. Surface shall show no deviations in excess of 1/2 inch when tested with a 10-foot straightedge

3.5 TOPSOIL

- A. Clear areas to receive topsoil for the finished surface of materials that would interfere with planting and maintenance operations. Scarify subgrade to a depth of 2 inches. Do not place topsoil when the subgrade or fill is frozen, extremely wet or dry, or in other conditions detrimental to seeding, planting, or grading. Spread topsoil to a uniform depth of 4 inches over the designated areas

### 3.6 PROTECTION

#### A. Shoring and Sheeting

1. The Contractor is responsible for the design of all shoring and sheeting systems. Provide shoring, bracing or sheeting where required. In addition to the requirements of Section 25 A and B of COE EM-385-1-1, and other requirements of this contract meet the following:
  - a. Prevent the undermining of pavements, foundations and slabs.
  - b. Slope banks where space permits.
  - c. Where shoring and sheeting materials remain in place in completed work to prevent settlements or damage to adjacent structures as directed, backfill the excavation to 3 feet below the finished grade and remove the remaining portion of the shoring before completing the backfill.

#### B. Drainage and Dewatering

1. Plan for and provide structures, equipment and construction for the collection and disposal of surface and subsurface water encountered during construction.
  - a. Drainage
    - 1) Dispose of surface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces.
    - 2) Surface dewatering plan shall include rerouting of any storm water runoff or natural drainage if necessary.
    - 3) Collect and dispose of surface and subsurface water encountered in the course of construction.
  - b. Dewatering
    - 1) Groundwater flowing toward or into excavations shall be controlled to prevent sloughing or excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction.
    - 2) French drains, sumps, ditches or trenches will not be permitted within three feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made.
    - 3) Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in-situ material. While the excavation is open, the water level shall be maintained continuously, at least one foot below the working level.
    - 4) Operate the dewatering system continuously, 24 hours per day, 7 days per week until construction work below existing water levels is complete. Have a back-up pump and system available for immediate use.

#### C. Erosion Control

1. Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings and as required to prevent sedimentation of downstream features.

#### D. Existing Utilities

1. All known utility facilities are shown schematically on the plans and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown on plans will not relieve the Contractor of his responsibility under this requirement. "Existing Utilities Facilities" means any utility that exists on the project in its original, relocated or newly installed position. The Contractor will be held responsible for the cost of repairs to damaged underground facilities; even when such facilities are not shown on the plans.
2. The Contractor shall contact all utility companies prior to beginning work and request accurate field location of their respective utility lines.
3. Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

E. Structures and surfaces

1. Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance.
2. Any repair or reestablishment of final grades shall be made prior to final acceptance.

3.7 INSPECTION AND TESTING

A. Inspections

1. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.
2. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours notices for all required observations or tests.

B. Testing

1. All testing shall be made at the Owner's expense. The Engineer shall approve test locations.
2. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.
3. The testing laboratory, Engineer, and Owner shall be given a minimum of 72 hours notice for all tests.
4. Laboratory Testing
  - a. Independent Testing laboratory shall operate in accordance with ASTM E 329 (latest edition) and shall be submitted to the engineer for approval.
  - b. Laboratory testing for maximum density and optimum moisture content shall be performed in accordance with ASTM D 1557 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials.
  - c. Laboratory testing for mechanical analysis shall be performed in accordance with ASTM D 2487.

- d. Laboratory testing for plasticity index shall be performed in accordance with ASTM D 4318
- e. Frequency of laboratory testing
  - 1) Native soil subgrade - One maximum density, optimum moisture content, mechanical analysis and plasticity index test for each material encountered that will serve as subgrade.
  - 2) Fill/Backfill - One maximum density, optimum moisture content, mechanical analysis and plasticity index for each source and type of material to be used.
- 5. Field testing
  - a. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. The Owner, Engineer, and Contractor shall be provided copies of reports within 72 hours of the time the test was performed. In the event that any test performed fails to meet these specifications, the Owner, Engineer and Contractor shall be notified immediately by Independent Testing Laboratory. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.
  - b. Field density tests for in-place materials shall be performed in accordance with one of the following:
    - 1) Sand Cone Method - ASTM D 1556
    - 2) Balloon Method - ASTM D 2167
    - 3) Nuclear Method - ASTM D 6938
  - c. Frequency of field testing
    - 1) Subgrade
      - a) One test per 30 Linear Feet of pavement (minimum of 3 per lift)
    - 2) Fill/Backfill
      - a) One test per 30 Linear Feet of pavement per lift (minimum of 3 per lift)
- C. Acceptance
  - 1. In the event that a tested material does not meet or exceed the specified requirements, the Contractor shall perform additional testing as directed by the Engineer to adequately define the limits of the material not meeting the specifications. Materials shall be re-tested to the satisfaction of the Engineer until specified requirements are met.
  - 2. All additional testing and work, which is the result of a failed test, shall be performed by the Contractor at no additional cost to the Owner.

**END OF SECTION 31 20 00**

SECTION 32 12 16  
ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers all work associated with:
  - 1. Aggregate Base Course
  - 2. Intermediate Course
  - 3. Base Course
  - 4. Prime Coat
  - 5. Tack Coat
  - 6. Asphaltic Concrete

1.2 DEFINITIONS

- A. Compaction: The process of mechanically stabilizing a material by increasing its density. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D 1557 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials, abbreviated in this specification as "\_\_\_ percent maximum density." "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure ASTM D 1188 or ASTM D 2726 "\_\_\_ percent maximum density for asphaltic concrete."
- B. Course: A layer or lift of soil or asphaltic concrete placed on top of a previously prepared or placed surface.
- C. Lift: A layer or course of soil or asphaltic concrete placed on top of a previously prepared or placed surface.
- D. Subgrade: Existing, in-situ soil or other material that is remaining after stripping or excavation. The subgrade is always existing material on which fill, or new structures are to be placed.

1.3 SUBMITTALS

- A. Asphaltic Concrete Mix Design: For each mix to be used on the project by course, submit a mix design prepared within 12 months of the date of the submittal in accordance with the following:
  - 1. Mix designs in compliance with requirements of the "South Carolina State Highway Department Standard Specification for Highway Construction". Mix design shall bear the approval of the South Carolina State Highway Department and shall be dated within 24 months of the date of the submittal. All materials listed in the mix design shall be the materials used to produce the asphaltic concrete.
- B. Laboratory Testing: Submit laboratory testing data for approval as identified in the paragraph titled "Laboratory Testing" for any the following materials to be used on the project before any material is delivered to the site.
  - 1. Graded Aggregate Base Course
    - a. Maximum density
  - 2. Asphaltic Concrete (intermediate course and surface course)
    - a. Maximum density



- C. Field Testing: Submit field testing data as identified in the paragraph titled "Field Testing" for the following:
  - 1. Aggregate Base Course
    - a. In place densities
    - b. Grade
    - c. Straight Edge
  - 2. Asphaltic Concrete (intermediate course and surface course)
    - a. In place density
    - b. Mix Design Compliance
    - c. Grade
    - d. Straight Edge
- D. Certifications: Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for the following:
  - 1. Aggregate Base Course
  - 2. Tack coat
  - 3. Prime coat
  - 4. Asphaltic Concrete (intermediate course and surface course)
    - a. Coarse aggregate
    - b. Fine aggregate
    - c. Mineral filler
    - d. Asphalt cement

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

#### 1.5 REGULATORY REQUIREMENTS

- A. Comply with federal, state and local regulatory requirements.

#### 1.6 CRITERIA FOR BIDDING

- A. Lump Sum Price
  - 1. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for the material, compaction, shaping, finishing, dressing, disposal of surplus material, testing, construction supervision and all other work required for satisfactory completion of the asphaltic concrete pavement system.

- B. Unit Prices
  - 1. None this Section.

#### 1.7 QUALITY ASSURANCE

- A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.
- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.

- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.
- D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- E. Environmental Conditions: Place bituminous mixture only during dry weather and on dry surfaces. Place asphaltic concrete only when surface temperature of underlying course is greater than 45 degrees F for course thicknesses greater than one inch and 55 degrees F for course thickness' one inch or less.
- F. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

## PART 2 - PRODUCTS

### 2.1 BASE COURSE

- A. Graded Aggregate Base Course
  - 1. Shall comply with requirements for Graded Aggregate Base Course as specified in Section 305 of the "South Carolina Department of Transportation Standard Specification for Highway Construction" and addendums.

### 2.2 PRIME COAT

- A. Shall comply with requirement for Prime Coat specified in Section 305 of the "South Carolina Department of Transportation Standard Specification for Highway Construction".

### 2.3 TACK COAT

- A. Shall comply with requirement for Tack Coat specified in Section 401 of the "South Carolina Department of Transportation Standard Specification for Highway Construction".

### 2.4 ASPHALTIC CONCRETE

- A. Shall be hot mixed, hot laid asphaltic concrete of the compacted thickness indicated.
- B. Intermediate course
  - 1. Shall comply with the following:
    - a. Shall comply with requirements for Hot Mix Asphalt Surface Course (Type-C) as specified in Sections 401 and 403 of the "South Carolina Department of Transportation Standard Specification for Highway Construction".
- C. Surface Course:
  - 1. Shall comply with requirements for Hot Mix Asphalt Surface Course (Type C) as specified in Sections 401 and 403 of the "South Carolina Department of Transportation Standard Specification for Highway Construction".

## PART 3 - EXECUTION

### 3.1 SAWCUTTING OF EXISTING PAVEMENTS

- A. Provide full depth sawcuts through existing asphaltic concrete pavements where new asphaltic concrete pavements are to join. Sawcuts shall be straight and vertical and shall be located a minimum of 3 inches from the existing edge or as indicated on the drawings.

### 3.2 PREPARATION OF SUBGRADE OR FILL

- A. Prepare subgrade and/or fill as specified in SECTION "EARTH MOVING".

### 3.3 BASE COURSES

- A. Aggregate Subbase and Graded Aggregate Base Course

#### 1. Placement

- a. Place aggregate base on prepared subgrade or fill in maximum loose lifts of 8 inches. Do not place on surfaces that are muddy, frozen or that contain frost. Total thickness shall be as indicated. Compact with equipment well suited for material being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment being used. Compact each lift as specified herein prior to placing the overlaying lift.

#### 2. Compaction

- a. Compact the base course through the full depth to not less than 100 percent of maximum laboratory density.

#### 3. Tolerances

- a. Finished grade of base course shall be within 0.05 feet of indicated finish grade.
- b. Finished surface of base course shall not vary more than 3/8 inch when tested with a 10-foot straightedge.
- c. Finished thickness of base course shall not vary more than one-half inch from the required thickness at any point and the average of all depth measurements shall be at least that indicated.
- d. Areas not meeting the specified requirements will be rejected until corrected by the Contractor

#### 4. Protection

- a. Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance. Any repair or reestablishment of final grades shall be made prior to final acceptance.

### 3.4 PRIME COAT

- A. Application

- 1. Apply not more than 0.28 gallon per square yard nor less than 0.25 gallon per square yard to the completed and accepted base course after receiving approval from the Engineer for priming. Where base consists of fossiliferous limestone, the prime rate shall be not more than 0.15 gallons per square yard nor less than 0.10 gallons per square yard. The prime shall only be applied when the base course is only slightly damp, and when temperature of the air in the shade is 55 degrees F or above. In places where the distributor bars cannot reach, it will be necessary to apply the prime coat with a hand sprayer attached to the distributor by a hose.

- B. Protection

1. Do not permit traffic on the primed area until the prime coat has cured adequately.

### 3.5 TACK COAT

#### A. Application

1. Apply not more than 0.15-gallon square yard nor less than 0.05 gallon per square yard to indicated contact surfaces. Net rate of application shall be 0.10 gallon per square yard of net bitumen. Apply half-rate application to prime coats that have been contaminated by traffic or dust. The tack coat shall only be applied when the contact surface is dry and when the temperature has not been below 35 degrees F for 12 hours immediately prior to application. The tack coat shall only be applied when the temperature of the air in the shade is 55 degrees F or above. Work shall be planned so that no more tack coat than is necessary for the day's operation is placed on the surface. In places where the distributor bars cannot reach, it will be necessary to apply the tack coat with a hand sprayer attached to the distributor by a hose. When hand spray methods are used, care should be taken to give the surface a very light application of the asphalt.

#### B. Protection

1. Except paving equipment, do not permit any traffic on tacked surfaces.

### 3.6 ASPHALTIC CONCRETE

#### A. Mixing and Preparation of Bituminous Mixture

1. Plant mix bituminous mixture to comply with requirements specified herein.

#### B. Transportation of Bituminous Mixture

1. Transport bituminous mixture in trucks having, tight, clean, smooth beds that have been coated with a minimum amount of a concentrated solution of hydrated lime and water to prevent adhesion of the mixture to the truck bodies. Each load shall be covered with canvas or other approved material of ample size to protect the mixture from the weather and to prevent loss of heat. Deliveries shall be made so that the spreading and rolling of all mixture prepared for one day's run can be completed during daylight, unless adequate, approved artificial lighting is provided. The mixture shall be delivered to the area to be paved in such a manner that the temperature at the time of dumping into the spreader will not be less than 250 degrees F. Any loads that are below minimum temperature, that have crusts of cold, unworkable material, or that have been wet excessively by rain will be rejected. Hauling over freshly laid material will not be permitted.

#### C. Machine Spreading

1. Prior to the laying of the asphaltic concrete, clean underlying course of foreign or objectionable matter with power blowers or power brooms, supplemented by hand brooms and other cleaning methods where necessary.
2. The range of temperatures of the mixtures at the time of spreading shall be between 250 degrees F and 300 degrees F. Bituminous concrete having temperatures less than minimum spreading temperature when dumped into the spreader will be rejected. Adjust spreader and regulate speed so that the surface of the course is smooth and continuous without tears and pulling, and of such depth that, when compacted, the surface conforms with the cross section, grade, and contour indicated. Unless otherwise directed, begin the placing along the centerline of areas to be paved on a crowned section or on the high side of areas with a one-way slope. Place mixture in consecutive adjacent strips having a

minimum width of 10 feet, except where the edge lanes require strips less than 10 feet to complete the area. Construct longitudinal joints and edges to true line markings. Establish lines parallel to the centerline of the area to be paved, and place string lines coinciding with the established lines for the spreading machine to follow. Provide the number and location of the lines needed to accomplish proper grade control. When specified grade and smoothness requirements can be met for initial lane construction by use of an approved long ski-type device of not less than 30 feet in length and for subsequent lane construction by use of a short ski or shoe, in-place string lines for grade control may be omitted. Place mixture as nearly continuous as possible and adjust the speed of placing as needed to permit proper rolling

D. Shoveling, Raking, and Tamping After Machine Spreading

1. Shovelers and rakers shall follow the spreading machine. Add or remove hot mixture and rake the mixture as required to obtain a course that when completed will conform to requirements specified herein. Broadcasting or fanning of mixture over areas being compacted is prohibited. When segregation occurs in the mixture during placing, suspend spreading operation until the cause is determined and corrected. Correct irregularities in alignment left by the spreader by trimming directly behind the machine. Immediately after trimming, compact edges of the course by tamping laterally with a metal lute or by other approved methods. Distortion of the course during tamping is prohibited.

E. Hand Spreading In lieu of Machine Spreading

1. In areas where the use of machine spreading is impractical, spread mixture by hand. The range of temperatures of the mixtures when dumped onto the area to be paved shall be between 250 and 300 degrees F. Mixtures having temperatures less than minimum spreading temperature when dumped onto the area to be paved will be rejected. Spread hot mixture with rakes in a uniformly loose layer of a thickness that, when compacted, will conform to the required grade, thickness, and smoothness. During hand spreading, place each shovel full of mixture by turning the shovel over in a manner that will prevent segregation. Do not place mixture by throwing or broadcasting from a shovel. Do not dump loads any faster than can be properly handled by the shovelers and rakers.

F. Compaction of Mixture

1. Compact mixture by rolling. Begin rolling as soon as placement of mixture will bear rollers. Delays in rolling freshly spread mixture shall not be permitted. Start rolling longitudinally at the extreme sides of the lanes and proceed toward center of pavement, or toward high side of pavement with a one-way slope. Operate rollers so that each trip overlaps the previous adjacent strip by at least one foot. Alternate trips of the roller shall be of slightly different lengths. Conduct tests for conformity with the specified crown, grade and smoothness immediately after initial rolling. Before continuing rolling, correct variations by removing or adding materials as necessary. If required, subject course to diagonal rolling with the steel wheeled roller crossing the lines of the previous rolling while mixture is hot and in a compactible condition. Speed of the rollers shall be slow enough to avoid displacement of hot mixture. Correct displacement of mixture immediately by use of rakes and fresh mixture or remove and replace mixture as directed. Continue rolling until roller marks are eliminated and course has a density of at least 96 percent but not more than 100 percent of that attained in a laboratory

specimen of the same mixture prepared in accordance with ASTM D 1559. During rolling, moisten wheels of the rollers enough to prevent adhesion of mixture to wheels, but excessive water is prohibited. Operation of rollers shall be by competent and experienced operators. Provide sufficient rollers for each spreading machine in operation on the job and to handle plant output. In places not accessible to the rollers, compact mixture thoroughly with hot hand tampers. Skin patching of an area after compaction is prohibited. Remove mixture that becomes mixed with foreign materials or is defective and replace with fresh mixture compacted to the density specified herein. Roller shall pass over unprotected edge of the course only when laying of course is to be discontinued for such length of time as to permit mixture to become cold.

G. Tolerances

1. Finished grade of asphaltic concrete shall be within 0.03 feet of indicated finish grade.
2. Finished surface shall not vary more than 1/8 inch when tested with a 10-foot straightedge.
3. The finished thickness shall not vary more than 1/4 inch from required thickness at any point and average thickness of depth measurements shall be at least the thickness indicated.
4. The finished surface shall be uniform in appearance and texture over the entire surface, including at joints. The entire surface shall be free of evidence of segregation, honeycombs and back scattering.
5. Areas not meeting the above requirements will be rejected until corrected by the Contractor.

H. Joints

1. Joints shall present the same texture and smoothness as other portions of the course, except permissible density at the joint may be up to 2 percent less than the specified course density. Carefully make joints between old and new pavement or within new pavements in a manner to ensure a thorough and continuous bond between old and new sections of the course. Vertical contact surfaces of previously constructed sections that are coated with dust, sand, or other objectionable material shall be painted with a thin uniform coat of emulsion or other approved bituminous material just before placing fresh mixture.
2. Transverse Joints
  - a. Roller shall pass over unprotected end of freshly laid mixture only when laying of course is to be discontinued. Except when an approved bulkhead is used, cut back the edge of previously laid course to expose an even, vertical surface for the full thickness of the course. When required, rake fresh mixture against joints, thoroughly tamp with hot tampers, smooth with hot smoothers, and roll. Transverse joints in adjacent lanes shall be offset a minimum of 2 feet.
3. Longitudinal Joints
  - a. Space 6 inches apart. Do not allow joints to coincide with joints of existing pavement or previously placed courses. Spreader screed shall overlap previously placed lanes 2 to 3 inches and be of such height to permit compaction to produce a smooth dense joint. With a lute, push back mixture placed on the surface of previous lanes to the joint edge. Do not scatter mix. Remove and waste excess material. When edges of longitudinal joints are irregular, honeycombed, or poorly compacted, cut back unsatisfactory

sections of joint and expose an even vertical surface for the full thickness of the course. When required, rake fresh mixture against joint, thoroughly tamp with hot tampers, smooth with hot smoothers, and roll while hot.

I. Protection

1. Do not permit traffic, including heavy equipment, on asphaltic concrete until surface temperature has cooled to at least 120 degrees F.

3.7 PROTECTION

A. Existing Pavement

1. Protect existing pavements to remain from damage. Movement of construction machinery and equipment over existing pavements during construction shall be at the Contractor's risk. Existing pavements damaged by the contractor's operations shall be repaired or replaced to their original condition at the contractor's expense.

B. Erosion Control

1. Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings.

C. Existing Utilities

1. Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact the local utility location company or each applicable utility company as required for assistance in locating existing utilities.

D. Structures and surfaces

1. Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance.

3.8 INSPECTION AND TESTING

A. Inspections

1. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.
2. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours' notice for all required observations or tests.

B. Testing

1. All testing shall be made at the Owner's expense. Test locations shall be approved by the Engineer.
2. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.

3. The testing laboratory, Engineer and Owner shall be given a minimum of 72 hours notice for all tests. Testing Agencies - Testing shall be done by a testing laboratory which operates in accordance with ASTM E-329 (latest revision) and approved by the Engineer prior to engagement. Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test. Agencies to be used shall be submitted to the Engineer for review prior to engagement.
4. Laboratory Testing
  - a. Graded Aggregate Base Course
    - 1) Laboratory testing for maximum density and optimum moisture content shall be performed in accordance with ASTM D for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials.
    - 2) Aggregate Base - One maximum density and optimum moisture content test for each source.
5. Field testing
  - a. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. The Owner, Engineer, and Contractor shall be provided copies of reports within 72 hours of the time the test was performed. In the event that any test performed fails to meet these specifications, the Owner, Engineer, and Contractor shall be notified immediately by Independent Testing Laboratory. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.
  - b. Graded Aggregate Base Courses:
    - 1) In-place density – 1 per 30 Linear Feet per course and per lift - in accordance with one of the following:
      - a) Sand Cone Method - ASTM D 1556
      - b) Balloon Method - ASTM D 2167
      - c) Nuclear Method - ASTM D 2922
    - 2) Grade - entire site. (50 feet grid maximum)
    - 3) Straightedge - entire site (25 feet grid maximum)
  - c. Asphaltic Concrete (intermediate course, Surface Course):
    - 1) Maximum density of compacted asphaltic concrete shall be determined in accordance with ASTM D 1188 or ASTM D 2726.
      - a) One density test for each batch, but no less than one test for each 250 tons of asphaltic concrete produced or fraction thereof of asphalt produced.
    - 2) Mix design compliance - Test asphaltic concrete produced for compliance with the approved mix design in accordance with the Marshall Method for Mix Design in the Asphalt Institute Manual Series No. 2 (MS-2).
      - a) One analysis for each batch, but no less than one analysis for each 250 tons of asphaltic concrete produced or fraction thereof of asphalt produced.



- 3) In place density - 1 per 30 Linear Feet per course and per lift - in accordance with one of the following:
  - a) ASTM D 2950
  - b) Determine by taking 4" diameter cores obtained from intermediate course and surface course. Separate course by sawing. Determine in-place density of cores in accordance ASTM D 1188 or ASTM D 2726.
- 4) Grade - entire site. (50 feet grid maximum)
- 5) Straightedge - entire site (25 feet grid maximum)

C. Acceptance

1. In the event that a tested material does not meet or exceed the specified requirements, the Contractor shall perform additional testing as directed by the Engineer to adequately define the limits of the material not meeting the specifications. Materials shall be re-tested to the satisfaction of the Engineer until specified requirements are met.
2. All additional testing and work, which is the result of a failed test, shall be performed by the Contractor at no additional cost to the Owner.

**END OF SECTION 32 12 16**

SECTION 32 16 13  
SITE WORK CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers all materials, labor and equipment for portland cement concrete used in structures, sidewalks, curb and gutter.

1.2 SUBMITTALS

- A. Mix Designs: The Contractor shall submit for review a design mix for each class of concrete proposed for use. The mix shall be prepared by an approved testing laboratory. Compressive strength of at least four (4) test specimens of the design mix shall indicate 15% higher than 28 days strength specified.
- B. Field Testing: Compressive strength tests

1.3 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store materials in a manner to prevent contamination or segregation. Do not stockpile materials in a manner or location that will cause excessive wetting or transporting of materials off-site or into storm drainage collection systems.

1.4 REGULATORY REQUIREMENTS

- A. Comply with all federal, state and local regulatory requirements.

1.5 CRITERIA FOR BIDDING

- A. Lump Sum Price
  - 1. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for the material, compaction, shaping, finishing, dressing, disposal of surplus material, testing construction supervision and all other work required for satisfactory completion of the portland cement concrete.
- B. Unit Prices
  - 1. None this Section.

1.6 QUALITY ASSURANCE

- A. Materials: All material submittals shall be submitted by the contractor and reviewed and accepted in writing by the Engineer prior to ordering of any materials.
- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.
- D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.

- E. Environmental Conditions: Concrete shall be mixed and placed only when temperature is at least 40 degrees F and rising.
- F. Equipment: Shall be well maintained, suited for the intended work and capable of delivering the finished product to the standards shown on drawings and as specified herein.

**PART 2 - PRODUCTS**

**2.1 CONCRETE**

- A. Design Mix in accordance with ACI 211.1.

Class	Compressive Strength (28 day)	Application
AA	4,000 psi	Pavements and driveways
A	3,000 psi	Curb and gutters, sidewalks, structures
B	2,500 psi	Thrust blocks

- 1. Cement: ATM C 150, Type I
- 2. Water: Shall be clean, fresh and potable.
- 3. Aggregates: ASTM C 33
- 4. Admixtures: Where not shown or specified, the use of admixtures is subject to the written approval of the Engineer.
  - a. Air Entraining: ASTM C 260, Use in all portland cement concrete pavement.
  - b. Retarding: ASTM C 494
  - c. Accelerating: ASTM D 98
  - d. Water Reducing: ASTM C 494
  - e. Fly Ash and Pozzolans: ASTM C 618, Types N, F, or C
  - f. Ground Iron Blast Furnace Slag: ASTM C 989, Grade 120

**2.2 FORMS**

- A. Shall be wood, plywood, metal, or other qualified material and shall be of the grade or type suitable to obtain the finish specified. Forms shall be constructed to the shape, for line, and grade required, and shall be maintained sufficiently rigid to prevent deformation under load. Form work and details construction shall conform to Chapter 6 of ACI 318.

**2.3 REINFORCEMENT**

- A. Reinforcing Steel: ASTM A 615, Grade 60.
- B. Mesh Reinforcement: ASTM A 1064, flat sheets.

**2.4 JOINT MATERIALS**

- A. Blocking Media: Compressible, non-shrinkable, non-reactive with joint sealant and non-absorption type such as plastic rod, free of oils or bitumens. Blocking media shall have a water absorption of not more than 5 percent by weight when tested in accordance with ASTM C 509. Blocking media shall be consistent with the joint sealant manufacturers installation instructions and be at least 25 percent larger in diameter than the width of the joint being sealed.
- B. Preformed Joint Filler: ASTM D 1751 or ASTM D 1752 Type II or III. Filler must be compatible with sealant. filler

C. Liquid Joint Sealant: Silicone joint sealant such as Dow Corning 890SL or approved equal.

D. CURING MATERIALS

1. Impervious Sheeting: ASTM C 171 with minimum sheet thickness of 10 mils. Non-reactive with other materials such as curing compound.
2. Liquid Membrane-Forming Compound: ASTM C 309, white pigmented, Type 2, Class B, free of paraffin or petroleum

2.5 ANCHORAGE ITEMS

A. Slots, inserts, clips, and other devices for anchoring masonry, wood, steel, and mechanical items to concrete shall be of standard manufacture, and of qualified types as required to engage and anchor the work specified under other sections.

PART 3 - EXECUTION

3.1 ON SITE OBSERVATION OF WORK

- A. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 48 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or Project Representative and improper work shall be reconstructed, and all materials, which do not conform to the requirements of the specifications, shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.
- B. The Contractor shall give the Project Engineer or Project Representative a minimum of 48 hours' notice for all required observations or tests.

3.2 PREPARATION BEFORE PLACING

- A. Water shall be removed from excavations before concrete is deposited. Hardened concrete debris, and other foreign materials shall be removed from the interior of forms and from the inside of mixing and conveying equipment. The reinforcement shall be made secure in position and shall be subject to examination and approval.
- B. Prepare surface to receive concrete in accordance with SECTION "EARTH MOVING".

3.3 FORMS

- A. Construct forms to be removable without damaging the concrete.
- B. Coating: Before placing the concrete, coat the contact surfaces of forms, (except existing pavement sections where bonding is required) with a non-staining mineral oil, non-staining form coating compound, or two coats of nitro-cellulose lacquer. When using existing pavement as a form, clean existing concrete and then coat with an asphalt emulsion bond breaker before concrete is placed.
- C. Grade and Alignment: Check and correct grade elevations and alignment of the forms immediately before placing the concrete.

3.4 REINFORCEMENT

- A. Metal reinforcement shall be free from rust, scale or other coatings, and shall be accurately placed and properly secured in position by concrete blocks or metal chairs and by spacers. Bars shall be bent cold. Exposed bars intended for bonding with fixture extensions shall be protected from corrosion by an accepted covering. Bar

chairs shall be hot dipped galvanized where in contact with forms for concrete that is exposed to view.

1. Concrete Protection over Steel Reinforcement: Concrete deposited against ground: 3 inches. Formed surfaces exposed to weather or ground: 2 inches for bars #6 and larger, 1-1/2 inch for bars less than #6. Interior surfaces, beams, girders, and columns: 1-1/2 inch. Slabs, walls, and joists: 3/4 inch for bars #11 and smaller.

### 3.5 MEASURING, MIXING, CONVEYING, AND PLACEMENT CONCRETE

- A. Measuring, mixing and conveying: ASTM C 94.
- B. Concrete mixed at the job site shall be mixed in a batch mixer in accordance with American Concrete Institute Standard A.C.I. 318, and in a similar manner subject to approval. Mixing time for stationary mixers over 1 cubic yard in capacity shall be increased 15 seconds for each additional 1/2 cubic yard or fraction thereof of material mixed.

### 3.6 PLACING CONCRETE

- A. Placing of concrete shall conform to Chapter 5 of ACI 318. Concrete having attained initial set or having contained water for one more than 90 minutes shall not be used in the work. Concrete shall not be dropped freely more than five feet on unexposed work, or more than three feet in exposed work. Concrete shall be mixed and placed only when temperature is at least 40 degrees F and rising. Concrete footings shall be placed only upon surfaces that are free from frost, ice, mud, or other detrimental circumstances. When placed on dry soil or pervious material, water proof paper or polyethylene sheeting shall be laid over the surfaces that are to receive the concrete.

### 3.7 FINISHES

- A. Concrete shall be deposited to the required thickness, compacted, screed to grade, and finished monolithically to a smooth broom finish. Where drains, or sumps occur, the concrete shall be sloped to drain. Slight honeycomb and minor defects shall be patched with cement mortar made with one-part cement and two parts fine aggregate and then rubbed smooth with carborundum brick. Patching shall be accomplished immediately after forms are removed. Immediately after removing forms, other exposed surfaces shall be dampened, brush-coated with grout, and rubbed with a wood float. Floating devices shall be rubbed with burlap and kept damp by fog spraying.

### 3.8 CURING

- A. Immediately after placing or finishing, concrete surfaces not covered by forms shall be protected against moisture loss for not less than 7 days by use of impervious sheeting or curing compound. Curing compound shall be applied in strict accordance with the manufacturer's recommendations.

### 3.9 BONDING AND GROUTING

- A. Before depositing new concrete on concrete that has set, the surface of the set concrete shall be thoroughly cleaned of laitance, foreign matter, and loose particles leaving a rough surface with clean and sound exposed aggregate. Forms shall be retightened and the surfaces of the set concrete shall be slushed with a grout coat of neat cement and water. Where an epoxy bonding agent is called for on the drawings, the epoxy bonding agent shall be polysulfide liquid polymer and an epoxy resin combined at the job site, in equal volumes and thoroughly mixed. The mixed agent

shall be applied on a clean concrete surface by brushing or spraying. A 10 mil coating shall be spread evenly to cover all bonding surfaces. When a bonding agent has been applied, and while the surface is still sticky, new concrete to be bonded shall be put in place.

### 3.10 PROTECTION

- A. Protect new portland cement concrete from damage for the duration of this contract.
- B. Existing Pavement: Protect existing pavements to remain from damage. Movement of construction machinery and equipment over existing pavements during construction shall be at the Contractor's risk. Existing pavements damaged by the contractor's operations shall be repaired or replaced to their original condition at the contractor's expense.
- C. Erosion Control: Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings.
- D. Existing Utilities: Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact the local utility location company or each applicable utility company as required for assistance in locating existing utilities.
- E. Structures and surfaces: Protect newly backfilled areas and adjacent structures, slopes, or grades from traffic, erosion settlement, or any other damage. Repair and reestablish damaged or eroded grades and slopes and restore surface construction prior to acceptance.

### 3.11 INSPECTION

- A. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.
- B. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours' notice for all required observations or tests.

### 3.12 TESTING

- A. General
  - 1. Owner will engage a qualified testing agency to perform tests and inspections.
    - a. Test locations shall be approved by the Engineer.
  - 2. Testing Agencies: Testing shall be done by a testing laboratory which operates in accordance with ASTM E 329 (latest revision) and approved by the Engineer prior to engagement.
    - a. Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an

- outside laboratory, and furnishes satisfactory certificates with the name of the one making the test.
- b. Agencies to be used shall be submitted to the Engineer for review prior to engagement.
3. The testing laboratory, Engineer and Owner shall be given a minimum of 72 hour notice for all tests.
  4. Test results and reports shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.
- B. Field Testing
1. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results.
  2. In the event that any test performed fails to meet these specifications, the Owner, Engineer and Contractor shall be notified immediately by Independent Testing Laboratory. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.
  3. Field test for concrete shall be performed as follows:
    - a. Compressive strength test: ASTM C 39
    - b. Grade
  4. Frequency of field testing
    - a. Compressive Strength: Three (3) test cylinders for each 50 cubic yards of concrete placed, or for each structure requiring more than 10 cubic yards of concrete. One cylinder shall be tested at 7 days and two at 28 days in accordance with ASTM C 39.
    - b. Grade: Check each structure, sidewalk or other feature for proper grade, slope and cross slope.
- C. Acceptance
1. In the event that a tested material does not meet or exceed the specified requirements, the Contractor shall perform additional testing as directed by the Engineer to adequately define the limits of the material not meeting the specifications. Materials shall be re-tested to the satisfaction of the Engineer until specified requirements are met.
  2. All additional testing and work, which is the result of a failed test, shall be paid for by the Contractor at no additional cost to the Owner.

**END OF SECTION 32 16 13**

SECTION 33 11 00  
POTABLE WATER SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This section covers all work associated with the furnishing and installation of all water mains and service lines and their associated appurtenances to include backflow preventers, valves, hydrants, thrust restraints and thrust blocking.

1.2 DEFINITIONS

- A. Water Main: A system of pipe, fittings and appurtenances equal to or greater than 4 inches in diameter that serves as a distribution system for potable water and/or fire protection.
- B. Water Line: Same as a water main.
- C. Water Service: A system of pipe, fittings, and appurtenances less than 4 inches in diameter that serves to provide potable water from a distribution water main to a point indicated.
- D. Subgrade: Existing, in-situ soil or other material that is remaining after stripping or excavation. The subgrade is always existing material on which fill, or new structures are to be placed.
- E. Excavation: The removal of soil or material to obtain a specified depth or elevation.
- F. Borrow: Material that must be transported to the site. A material that must be developed by others and transported to the site. Not available on site.
- G. Backfill: Fill material used in refilling a cut, trench or other excavation.
- H. Lift: A layer or course of material placed on top of a previously prepared or placed material.
- I. Unsuitable Material: Existing, in situ soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability. Materials classified as PT, OH, or OL by ASTM D 2487 are unsuitable. Unsuitable materials also include man-made fills, refuse, frozen material, uncompacted backfills from previous construction, unsound rock or soil lenses, or other deleterious or objectionable material.
- J. Granular Material: Soils classified as GW, GP, SW or SP by ASTM D 2487. Materials classified as GM and SM will be identified as granular only when fines have a plasticity index of zero.
- K. Compaction: The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D 1557 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials, abbreviated in this specification as "\_\_\_ percent maximum density."
- L. Bedding: The subgrade or fill material that directly supports the load of a pipe.

1.3 SUBMITTALS

- A. Dewatering Plan



1. Describe methods for removing collected water from open trenches and diverting surface water or piped flow away from work area. Describe equipment and procedures for installing and operating the dewatering system indicated. Describe the basic components of the dewatering system proposed for use and its planned method of operation. Record performance and effectiveness of method or system in use. The dewatering plan shall address, as a minimum, the requirements identified in the paragraph titled "Drainage and Dewatering"
  - B. Shoring and Sheeting Plan
    1. Describe the materials of the shoring system to be used. Indicate whether or not components will remain after filling or backfilling. Provide plans, sketches, or details along with calculations by a professional engineer. Indicate sequence and method of installation and removal.
  - C. Certifications - Provide manufacturer or supplier certification of compliance indicating conformance to this specification or the referenced standard(s) for each of the following to be used in this project:
    1. Water Main Piping
      - a. Ductile Iron Pipe
      - b. C900 PVC
    2. Valves, hydrants and other appurtenances
      - a. Valves
      - b. Backflow Preventers
      - c. Hydrants
      - d. Valve Boxes
      - e. Tapping Machines
      - f. Meters
  - D. Laboratory Testing - Submit testing data as identified in the paragraph titled "Laboratory Testing" for any of the following materials to be used on the project. Obtain approval before any material is delivered to the site.
    1. Subgrade
    2. Common fill
    3. Controlled fill
    4. Granular fill
    5. Bacteriological Testing
  - E. Field Testing - Submit field testing data as identified in the paragraph titled "Field Testing" for the following:
    1. Subgrade compaction & density
    2. Excavation compaction & density
    3. Fill/backfill compaction & density
    4. Hydrostatic and Leakage Testing
- 1.4 DELIVERY, STORAGE AND HANDLING
- A. Delivery and storage
    1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris

2. Metal items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

B. Handling

1. Handle pipe, fittings, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care not to damage coatings and linings on pipe and fittings; if damaged, make repairs. Carry, do not drag pipe to trench.

1.5 REGULATORY REQUIREMENTS

- A. Comply with federal, state, and local regulations.
- B. Comply with the materials and specifications of the City of Walhalla.

1.6 CRITERIA FOR BIDDING

- A. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the plans and specifications. Any portion of the work not specifically listed in the bid form shall be deemed a part of the item with which it is associated and shall be included in the lump sum price. The price shall be full compensation for the excavating, filling, transporting of material, compaction, shaping, finishing, dressing, disposal of surplus material, testing, staking, construction supervision and all other work required for satisfactory completion of the potable water system operations.

B. Unit Prices

1. None this Section.

1.7 QUALITY ASSURANCE

- A. Materials: The Contractor will furnish the Engineer and Owner all submittals identified in the paragraph "Submittals" before ordering. The Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material.
- B. Manufacturer: Material and equipment shall be the standard products of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the projects.
- C. Subcontractor: A subcontractor for any part of the work must have experience on similar work. At the option of the Engineer, a list of projects and the Owners or Engineers who are familiar with his competence may be required to be submitted to verify experience.
- D. Design: Devices, equipment, structures, and systems not designed by the Engineer that the Contractor wishes to furnish shall be designed by either a registered professional engineer or by someone the Engineer accepts as qualified. Complete design calculations and assumptions shall be furnished to the Engineer or Owner before acceptance.
- E. Testing Agencies: Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test. Agencies to be used shall be submitted to the Engineer for review prior to engagement.

## 1.8 SEQUENCING AND SCHEDULING

- A. The Contractor shall arrange his work so that section of mains between valves are tested, sterilized, pavement replaced, and the section placed in service as soon as reasonable after it is placed.

## 1.9 GUARANTEE:

- A. The Contractor shall guarantee the quality of the materials, equipment, and workmanship for a period of 12 months after acceptance. Defects discovered during that period shall be repaired by the Contractor at no cost to the Owner.

## 1.10 CONNECT NEW MAIN TO EXISTING SYSTEMS:

- A. The Contractor shall furnish the necessary pipe and perform all excavation, dewatering, shoring, backfilling, etc. necessary to make the connection of a main to the existing water system. The Contractor shall contact the utility a minimum of 72 hours in advance of construction. The Contractor shall be responsible for coordinating his construction with the utility.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. All material or products which come into contact with drinking water shall be third party certified as meeting the specifications of ANSI/NSF 61. The certifying party shall be accredited by the American National Standards Institute.
- B. All pipe, fittings, packing, jointing materials, valves, and fire hydrants shall conform to Section C of the AWWA Standards.
- C. Natural rubber or other material which will support microbiological growth may not be used for any gaskets, O-rings, and other products used for jointing pipes setting meters or valves, or other appurtenances which will expose the material to the water.
- D. Any pipe, solder, or flux which is used in the installation or repair of any public water system, used in any plumbing which provides water through connection to a public water system, for human consumption, shall be lead free. Lead free, for solder and flux, means those containing not more than 0.2% lead. Lead free, for pipes and pipe fittings, as those containing not more than 8.0% lead. Leaded joints necessary for the repair of CIP shall be exempt from the above.

### 2.2 WATER MAINS

- A. Ductile Iron Pipe: Shall conform to ANSI A21.5 - (AWWA C150) latest revisions and ANSI A21.51 (AWWA C151) latest revision. All 4" pipe shall be class 51 unless noted otherwise. All pipe 6" to 54" shall be class 50. It shall be cement lined in accordance with ANSI A 21.4 or AWWA C104.
  - 1. Only products of the American Cast Iron Pipe Co., Griffin Pipe Co., US Pipe Co., and McWane Cast Iron Pipe Co. shall be used.
- B. PVC: Pipe 4 inches and larger shall conform to all requirements of the AWWA C900 latest revision for PVC pipe. PVC D1784, pressure rating of 150 psi.
  - 1. Shall have the following minimum wall thickness:
    - a. 4" 0.267 inches
    - b. 6" 0.383 inches
    - c. 8" 0.503 inches
    - d. 10" 0.617 inches
    - e. 12" 0.733 inches

2. The use of solvent-weld PVC pipe and fittings in water mains 4 inches and larger is prohibited.
3. Pipe with diameter less than 4 inches shall conform to all requirements of ASTM D1785 and D2241 (SDR 21). The pipe shall have a minimum pressure rating of 200 psi.
4. Certificates of conformance with the foregoing specifications shall be furnished with each lot of pipe supplied. All PVC pipe shall bear the National Sanitation Foundation.

C. All above ground mains shall be ductile iron pipe as specified.

### 2.3 JOINTS

- A. Flanged Joints - Shall conform to ANSI A21.15 (AWWA C115) latest revision. Bolts shall conform to ANSI B18.2.1 and nuts shall conform to ANSI B 18.2.2. Gaskets shall be rubber, either ring or full face, and shall be 1/8 inch thick. Gaskets shall conform to the dimensions recommended by AWWA C115 latest revision.
- B. Mechanical Joints - In ductile iron pipe shall conform to ANSI A21.11 (AWWA C111) latest revision.
- C. Push-on Joints - In ductile iron pipe shall conform to ANSI A21.11 latest revision. Lubricants which will support microbiological growth shall not be used for slip-on joints. The use of vegetable oil is prohibited.
- D. Plastic Pipe - Joints in plastic pipe shall conform to ASTM D3139 and ASTM F477 latest revision.

### 2.4 FITTINGS

- A. Fittings for Ductile Iron and PVC Pipe - Shall be ductile iron, manufactured in accordance with AWWA C110 or AWWA C153 latest revision. They shall be cement lines in accordance with ANSI A21.4 (AWWA C104) latest revision. Fittings shall be designed to accommodate the type of pipe used.
- B. Fittings for Flanged Pipe - Shall be manufactured in accordance with ANSI B16.1, Class 125 flanges.

### 2.5 GATE VALVES AND VALVE BOXES

- A. Acceptable Manufacturers - Only products of the Mueller company and American Darling Valve Company or equivalent shall be used.
- B. General - Gate valves shall be standard on 3 inches through 12-inch installations.
- C. Gate valves shall be 12" or smaller and shall conform to the following:
  1. Resilient seat type conforming to AWWA C509.
  2. Epoxy coated inside and outside conforming to AWWA C550.
  3. Ends shall be mechanical joint conforming to ANSI/AQWWA C111/A21.11.
  4. Rated for a 200-psi working pressure.
- D. Tapping valves 12" and smaller shall conform to the following:
  1. Resilient seat type conforming to AWWA C509
  2. Epoxy coated inside and outside conforming to AWWA C550.
  3. Ends shall be flanged by mechanical joint conforming to ANSI B16.1, Class 125 and ANSI/AWWA C111/A21.11 respectively.
  4. Rated for a 200-psi working pressure.
- E. Indicator Posts - UL 789. Provide for gate valves where indicated.

F. Other Requirements:

1. All valves shall have Grade B cast iron bodies conforming to ASTM A126.
2. All valves shall have a two (2) inch square operating nut for buried service.
3. All valves shall have open left operation.
4. All valves shall be equipped with a non-rising stem.
5. All valves shall be constructed with zinc plated steel bolts and nuts.
6. Shall be in conformance with the latest revision of all referenced standards of AWWA or ANSI shall prevail.
7. Valve boxes with drop covers will be of cast iron.

G. Valve Box: Valve boxes shall be full cast iron with cast iron covers suitable for heavy traffic use and conform to ASTM A48, Class 20 Specifications. Valve boxes shall be screw type and have a 5-1/4 inch inside shaft diameter. All parts shall have an asphaltic coating inside and outside with a minimum of 1 mil thickness.

1. Products of Tyler Pipe/Utility Division #6950 Series and Bingham and Taylor #4905 of U.S. Manufacture or equivalent.

H. Reduced Pressure Backflow Preventer or Double Check Valve Assembly - Any water supply project involving the use of a reduced pressure backflow preventer or double check valve assembly, will not be given final approval for operation until the backflow prevention devices have been tested by a certified tester.

2.6 FIRE HYDRANTS

A. Only the following companies and products shall be used:

1. Mueller Company (Centurion)

B. Fire hydrants shall be compression type, opening against pressure and closing with pressure and conform to:

1. AWWA C502 - Dry Barrel Fire Hydrants

C. Interior shall be two-part thermosetting epoxy coated holiday free to a minimum of 4 mils thick conforming to:

1. AWWA C550 - Protective Interior Coatings for Valves and Hydrants

D. Exterior coating shall be as follows:

1. Hydrant barrel will be painted red.
2. Weather cap, operating nut, and nozzle caps will be painted red.
3. Hydrant parts below ground will be asphaltic coated.
4. An all bronze seat ring shall thread directly into an all bronze drain ring or heavy bronze bushing located between the lower hydrant barrel and shoe securely retained in this position, or it may be threaded into a heavy bronze busing in the hydrant shoe. Drain rings cast into iron body is not acceptable.
5. All bronze or brass internal working parts in contact with service water to be low in zinc content.

E. Connections between the hydrant and the water main shall be mechanical joints with retained glands conforming to:

1. ANSI/AWWA - Rubber Gasket Joints for Grey Iron and C111/A21.11 Ductile Iron Pressure Pipe and Fittings.

F. Hydrants shall be wrapped in accordance with:

1. ANSI/AWWA C105/A21.5 - Polyethylene Encasement for Ductile Iron piping for Water and Other Liquids
2. Thickness: 8 mils

- G. Hydrants shall have a 6" mechanical joint connection with 5-1/4" main valve.
- H. Hydrant shall have 2-1/2" hose nozzles and one 4-1/2" pumper nozzle with mechanical removal feature, set screws, lock rings, etc., and shall conform to existing national standard specifications and ANSI B26.
- I. Barrel lengths shall generally be for 3-1/2' bury.
- J. Hydrants shall open left.
- K. Hydrants shall have a 150-psi working pressure.
- L. Hydrants shall be traffic designed.
- M. Retaining bolts of shoe to lower barrel shall be stainless steel.
- N. Upper assembly shall be provided with a grease or oil reservoir that automatically lubricates all operating stem threads and bearing surfaces each time of operation. The system shall be completely sealed from the waterway and external contaminants. The reservoir is to have an external filler point that does not require dismantling any portion of the hydrant during regular maintenance.
- O. Casting shall indicate type, design and date manufacturer.
- P. All fire hydrants shall be tested to 300 psi test pressure before shipping.
- Q. All fire hydrant leads shall include six (6") mechanical joint gate valve attached to the six (6") inch side outlet of the mainline tee by means of an anchoring coupling with a laying length of 12 inches.

## 2.7 TAPPING SLEEVES/CROSSES

- A. Shall be mechanical joint type sized to fit the intercepted pipe. They shall have duck-tipped end gaskets and shall be equal to Mueller H-615/715 with a tapping valve attached. The outlet end of the valve shall have a joint suitable for the type of pipe to be used in the new branch. The Sleeve/Cross shall be sized to fit the intercepted pipe without leaking.

## 2.8 METAL DETECTOR TAPE

- A. Will be used over all non-metallic pipe. The tape shall be laid 18 inches from finished grade and shall consist of 0.35 mils thick solid soil core encased in a protective plastic jacket that is resistant to alkalis, acids, and other destructive elements found in the soil. The lamination bond shall be strong enough that the layers cannot be separated by hand. Total composite thickness to be 5.0 mils. Foil core to be visible from unprinted side to ensure continuity. The tape shall have a minimum 3-inch width and a tensile strength of 84 pounds per three-inch-wide strip.
- B. A continuous warning message repeated every 16" to 36" shall be imprinted on the tape surface. The tape shall contain an opaque color concentrate designating the color code appropriate to the line being buried (Water Systems - Safety Precaution Blue; Sewer Systems - Safety Green)

## 2.9 BOLTS, NUTS, AND ALL-THREAD ROD

- A. Bolts, nuts, and all-thread rod shall be made of either high-strength cast iron containing a minimum of 0.50 percent copper, or high-strength low-carbon steel per ASTM A307, specifications for carbon steel externally threaded standard features, Grade B, having a minimum yield strength of 45,000 psi.
- B. Stainless steel materials shall contain sufficient chromium to resist corrosion, oxidation and rust.

- C. Materials shall be sound, clean, and coated with a rust resistant lubricant.
- D. Threads shall be in accordance with ANSI B1.1, Unified Inch Screw Threads, and with B1.2, Screw Threads, Gages, and Gaging, conforming to the coarse thread series (UNC) Unified Chords, with threads Class 2A internal and Class 2B external.
- E. Bolts 3/4" and smaller shall be furnished with heavy hex heads conforming to ANSI B18.2.1
- F. Bolts larger than 3/4" may have either standard or heavy hex heads conforming to ANSI B18.2.1

2.10 POLYETHELENE ENCASEMENT

- A. Conforms to ANSI 21.5 (AWWA C105)
- B. 8 mil Polyethylene Tube

2.11 BEDDING AND BACKFILL MATERIAL

- A. Crushed stone and gravel conforming to ASTM C33, Gradation 67 (3/4" to No. 4)
- B. Clean, well graded Class II and/or Class III soils. Class IV and Class V materials are not allowed. See the following table for a description of classes:

SOIL CLASS	SOIL TYPE	DESCRIPTION OF MATERIAL CLASSIFICATION
Class I Soils*		Manufactured, angular material, 1/4 to 1-1/2 inches (6 to 40 mm) size, including materials having regional significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells.
Class II Soils**	GW	Well graded gravel and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean
	GP	Poorly graded gravel and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean
	SW	Well-graded sands and gravelly sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	SP	Poorly-graded sands and gravelly sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean
Class III Soils***	GM	Silty Gravel, gravel-sand-silt mixtures, 50% or more retained on No. 4 sieve. More than 50% retained on No. 200 sieve.
	GC	Clayey Gravel, gravel-sand-clay mixtures, 50% or more retained on No. 4 sieve. More than 50% retained on No. 200 sieve.
	SM	Silty Sands, sand-silt mixtures, more than 50% retained on No. 4 sieve. More than 50% retained on No. 200 sieve.
	SC	
		Clayey Sands, sand-clay mixtures, more than 50%

		retained on No. 4 sieve. More than 50% retained on No. 200 sieve.
Class IV Soils	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands. Liquid limit of 50% or less. 50% or more passes No. 200 sieve.
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. Liquid limit of 50% or less. 50% or more passes No. 200 sieve.
	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.
	CH	Inorganic clays of high plasticity, fat clays. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.
Class V Soils	OL	Organic silts and organic silty clays of low plasticity. Liquid limit 50% or less. 50% or more passes No. 200 sieve.
	OH	Organic clays of medium to high plasticity. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.
	PT	Peat, muck and other highly organic soils.

- \* Solids defined as Class I materials are not defined in ASTM D2487
- \*\* In accordance with ASTM D2487, less than 5% pass No. 200 sieve
- \*\*\* In accordance with ASTM D2487, more than 12% pass No. 200 sieve. Soils with 5% to 12% pass No. 200 sieve fall in borderline classification, e.g. GP-CG

**PART 3 - EXECUTION**

**3.1 INSTALLATION OF WATER MAINS**

- A. No flushing devices shall be directly connected to any sewer.
- B. Chambers, pits, or manholes containing valves, blow-offs, meters, air relief valves, other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer.
- C. Installation of water mains and appurtenances shall be conducted in accordance with Section C of the AWWA Standards and/or manufacturer's recommended installation procedures.
- D. All water mains shall be provided with a minimum of 30 inches of cover, unless pipe material is steel, concrete, DIP, or other approved material, and if exposed should be insulated to prevent freezing.
- E. All tees, bends, plugs, and hydrants on lines 2.5 inches in diameter and larger shall be provided with reaction blocking, tie rods, or other approved method of restraint.
- F. These requirements shall apply to all pipeline installation except where specific exception is made in the "Special Requirements..." paragraphs.
- G. Terminate the work covered by this section at a point approximately 5 feet from the building, unless otherwise indicated. Where the location of the water line is not clearly defined by dimensions on the drawings, do not lay water line closer horizontally 10 feet from any sewer line. Where water lines cross under gravity sewer lines, encase sewer line fully in concrete for a distance of at least 10 feet on each side of the crossing,



unless sewer line is made of pressure pipe with rubber-gasketed joints and no joint is located within 3 feet horizontally of the crossing. Lay water lines which cross sewer force mains and inverted siphons at least 2 feet above these sewer lines; when joints in the sewer line are closer than 3 feet horizontally from the water line, encase these joints in concrete. Do not lay water lines in the same trench with gas lines, fuel lines or electric wiring.

### 3.2 WATER PIPING INSTALLATION PARALLEL WITH SEWER PIPING

- A. Normal Conditions: Lay water piping at least 10 feet horizontally from a sewer or sewer manhole whenever possible. Measure the distance edge-to-edge.
- B. Unusual Conditions: When local conditions prevent a horizontal separation of 10 feet, the water piping may be laid closer to a sewer or sewer manhole provided that:
  - 1. The bottom (invert) of the water piping shall be at least 18 inches above the top (crown) of the sewer piping.
  - 2. Where this vertical separation cannot be obtained, the sewer piping shall be constructed of AWWA-approved water pipe and pressure tested in place without leakage prior to backfilling.
  - 3. The sewer manhole shall be of watertight construction and tested in place.
- C. Installation of Water Piping Crossing Sewer Piping
  - 1. Normal Conditions: Water piping crossing above sewer piping shall be laid to provide a separation of at least 18 inches between the bottom of the water piping and the top of the sewer piping.
  - 2. Unusual Conditions: When local conditions prevent a vertical separation described above, use the following construction:
    - a. Sewer piping passing over or under water piping shall be constructed of AWWA-approved water piping, pressure tested in place without leakage prior to backfilling
    - b. Water piping passing under sewer piping shall, in addition, be protected by providing a vertical separation of at least 18 inches between the bottom of the sewer piping and the top of the water piping; adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping; and that the length, minimum 18 feet, of the water piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer piping
    - c. Sewer Piping or Sewer Manholes: No water piping shall pass through or come in contact with any part of a sewer manhole
- D. Backfilling and Compaction - All trenches and excavations shall be backfilled immediately after the pipes are laid therein, unless other protection of the pipe is directed. The backfilling material shall be selected and deposited with special reference to the future safety of the pipes. The material shall be completely void of rocks, roots, sticks, or any other debris that might cause damage to the pipe and tubing or that might prevent proper compaction of the backfill. Except where special methods of bedding and tamping are provided for, clean earth or sand shall be solidly tamped about the pipe up to a level at least 2 two feet above the top of the pipes, and shall be carefully deposited for, clean earth or sand shall be solidly tamped or rammed with proper tools so as not to injure or disturb the pipe. The remainder of the backfilling of the trench shall be carried on simultaneously on both sides of the pipe in such a manner that injurious side pressure does not occur. The material used may be

selected from excavated material anywhere on the work in any of the material is suitable.

1. Under traffic areas, the top 24 inches of backfill material shall be compacted to a density of not less than 98% modified proctor. Below the 24-inch line to, and including the area around the pipe, the density shall not be less than 95%, at optimum moisture. In other than traffic areas, the backfill shall be compacted to 95% at optimum moisture. The tests are to be taken at the direction of the Engineer to average not more than 100-foot intervals.
  2. Whenever the trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed off and finally made to conform to the surface of the ground. Backfilling shall be carefully performed, and the original surface restored to the full satisfaction of the Engineer immediately after installation.
  3. Where PVC pipe is installed, the Contractor shall take precautions, in accordance with ASTM D2321, during the backfill operations so as not to create excessive side pressures, or horizontal or vertical deflection of the pipe, nor impair flow capacity.
  4. Plastic tubing for house service lines shall be installed in a manner that will prevent abrupt changes or bends in any direction. The Contractor shall exercise extreme caution to prevent crimping of the tubing during handling, storage and installation. The tubing shall have an absolute positive connection to the water main to prevent leakage.
  5. Bedding – A continuous and uniform bedding shall be provided in the trench for all buried pipe.
- E. Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated and where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation.
- F. Installation of Tracer Wire - All water mains shall be detectable within 3 feet with electronic locating equipment. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.
- 3.3 SPECIAL REQUIREMENTS FOR INSTALLATION OF WATER MAINS
- A. Installation of Ductile Iron Piping - Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of

Pipelines" and with the requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

1. Jointing: Make push-on joints with the gaskets and lubricant specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly. Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111/A21.11. Make flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts to make up for misalignment of bolt holes or for any other purpose will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fitting has dimensions that do not allow the making of a proper flanged joint as specified, replace it by one of proper dimensions. Use setscrewed flanges to make flanged joints where conditions prevent the use of full-length flanged pipe and assemble in accordance with the recommendations of the setscrewed flange manufacturer. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer.
  2. Exterior Protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet, using Class A polyethylene film, in accordance with AWWA C105/A21.5.
- B. Installation of PVC Piping - Installation of PVC Plastic Water Main Pipe and Associated Fittings: Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines"; with the requirements of UBPPA UNI-B-3 for laying of pipe, joining PVC pipe to fittings and accessories, and setting of hydrants, valves, and fittings; and with the recommendations for pipe joint assembly and appurtenance installation in AWWA M23, Chapter 7, "Installation."
1. Jointing - Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint. Use an approved lubricant recommended by the pipe manufacturer for push-on joints. Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of UBPPA UNI-B-3 for laying the pipe and the recommendations in AWWA M23, Chapter 7, "Installation," for pipe joint assembly. Assemble push-on joints for connection to fittings, valves, and other accessories in accordance with the requirements of UBPPA UNI-B-3 for joining PVC pipe to fittings and accessories and with the applicable requirements of AWWA C600 for joint assembly. Make compression-type joints/mechanical joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint; assemble in accordance with the requirements of UBPPA UNI-B-3 for joining PVC pipe to fittings and accessories, with the applicable requirements of AWWA C600 for joint assembly, and with the

recommendations of Appendix A to AWWA C111/A21.11. Cut off spigot end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

- C. Thrust Restraint - All tees, plugs, caps and bends which are equal to or greater than 11-1/4 degrees and equal to or greater than 4 inches in diameter shall be provided with adequate thrust restraint using either thrust blocking, restrained joint or a combination of both.
1. Thrust blocking shall bear directly against the undisturbed trench wall and shall be made of 3,000 psi concrete. Place the blocking so that the pipe and fittings will be accessible to repairs or reworking joints as may become necessary.
  2. EBBA Iron Sales, Megalug retainer glands or equivalent may be use din lieu of thrust blocking or in combination with thrust blocking where appropriate or as indicated by the Engineer.
- D. Installation of Valves and Hydrants
1. Installation of Valves: Install gate valves, AWWA C500 and UL 262, in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to AWWA C500. Install gate valves, AWWA C509, in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to AWWA C509. Install gate valves on PVC water mains in accordance with the recommendations for appurtenance installation in AWWA M23, Chapter 7, "Installation." Install check valves in accordance with the applicable requirements of AWWA C600 for valve-and-fitting installation, except as otherwise indicated. Make and assemble joints to gate valves and check valves as specified for making and assembling the same type joints between pipe and fittings
  2. Installation of Hydrants: Install hydrants, except for metal harness, in accordance with AWWA C600 for hydrant installation and as indicated. Make and assemble joints as specified for making and assembling the same type joints between pipe and fittings. Provide metal harness as specified under pipe anchorage requirements for the respective pipeline material to which hydrant is attached. A concrete block 1'x1'x2' shall be poured between the back of the hydrant and undisturbed earth of the trench side
- E. Installation of Backflow Prevention Devices
1. There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contamination materials may be discharged or drawn into the system.
  2. No by-passes shall be allowed, unless the bypass is also equipped with an equal, approved backflow prevention device.
  3. High hazard category cross connections shall require an air gap separation or an approved reduced pressure backflow preventer.
  4. Reduced pressure principal backflow prevention assemblies shall not be installed in any area location subject to possible flooding. This includes pits or vaults which are not provided with a gravity drain to the ground's surface that is capable of exceeding the discharge rate of the relief valve. Generally, if installed in a pit, the drain line shall be 2 times the size of the line entering the backflow prevention

device. The drain cannot empty into any type of ditch, storm drain, or sewer, which could flood water back into the pit.

5. All piping up to the inlet to the backflow prevention device must be suitable for potable water. The pipe must be AWWA or NSF approved. Black steel pipe cannot be used on the inlet side of the device.
6. Fire line sprinkler systems and dedicated fire lines, except those in the high hazard category shall be protected by an approved double check valve assembly.

### 3.4 SPECIAL REQUIREMENTS FOR INSTALLATION OF WATER SERVICE PIPING

- A. Installation of Metallic Piping - Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the applicable requirements of AWWA C600 for pipe installation, unless otherwise specified.
  1. Jointing
    - a. Screwed Joints: Make screwed joints up tight with a stiff mixture of graphite and oil, inert filler and oil, or graphite compound; apply to male threads only. Threads shall be full cut; do not leave more than three threads on the pipe exposed after assembling the joint.
    - b. Joints for Copper Tubing: Cut copper tubing with square ends; remove fins and burrs. Handle tubing carefully; replace dented, gouged, or otherwise damaged tubing with undamaged tubing. Make solder joints using ASTM B 32, 95-5 tin-antimony or Grade Sn96 solder. Solder and flux shall contain not more than 0.2 percent lead. Before making joint, clean ends of tubing and inside of fitting or coupling with wire brush or abrasive. Apply a rosin flux to the tubing end and on recess inside of fitting or coupling. Insert tubing end into fitting or coupling for the full depth of the recess and solder. For compression joints on flared tubing, insert tubing through the coupling nut and flare tubing.
    - c. Flanged Joints: Make flanged joints up tight, taking care to avoid undue strain on flanges, valves, fittings, and accessories.
- B. Installation of Plastic piping - Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the applicable requirements of ASTM D 2774, unless otherwise specified. Handle solvent cements used to join plastic piping in accordance with ASTM F 402.
  1. Jointing - Make solvent-cemented joints for PVC plastic piping using the solvent cement previously specified for this material; assemble joints in accordance with ASTM D 2855. Make solvent-cemented joints for ABS plastic piping using the solvent cement previously specified for this material; assemble joints in accordance with the recommendations of the pipe manufacturer, as approved. Make plastic pipe joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer
  2. Plastic Pipe Connections to Appurtenances: Connect plastic pipe service lines to corporation stops and gate valves in accordance with the recommendations of the plastic pipe manufacturer.

### 3.5 PROTECTION

- A. Shoring and Sheeting: The Contractor is responsible for the design of all shoring and sheeting systems. Provide shoring, bracing or sheeting where required. In addition to the requirements of Section 25 A and B of COE EM-385-1-1, and other requirements of this contract meet the following:
  1. Prevent the undermining of pavements, foundations and slabs.

2. Slope banks where space permits.
  3. Where shoring and sheeting materials remain in place in completed work to prevent settlements or damage to adjacent structures as directed, backfill the excavation to 3 feet below the finished grade and remove the remaining portion of the shoring before completing the backfill.
- B. Drainage and Dewatering: Plan for and provide structures, equipment and construction for the collection and disposal of surface and subsurface water encountered during construction.
1. Drainage
    - a. Dispose of surface water which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include rerouting of any storm water runoff or natural drainage if necessary. Collect and dispose of surface and subsurface water encountered in the course of construction.
  2. Dewatering
    - a. Groundwater flowing toward or into excavations shall be controlled to prevent sloughing or excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in-situ material. While the excavation is open, the water level shall be maintained continuously, at least 1 foot below the working level.
    - b. Operate the dewatering system continuously, 24 hours per day, 7 days per week until construction work below existing water levels is complete. Have a back-up pump and system available for immediate use.
- C. Erosion Control
1. Protect existing streams, ditches, and storm drain inlets from water-borne soil by the means indicated on the contract drawings.
- D. Existing Utilities
1. All known utility facilities are shown schematically on the plans and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown on plans will not relieve the Contractor of his responsibility under this requirement. "Existing Utilities Facilities" means any utility that exists on the project in its original, relocated or newly installed position. The Contractor will be held responsible for the cost of repairs to damaged underground facilities; even when such facilities are not shown on the plans.
  2. The Contractor shall contact all utility companies prior to beginning work and request accurate field location of their respective utility lines.
  3. Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.
- E. Structures and surfaces
1. Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance.

2. Any repair or reestablishment of final grades shall be made prior to final acceptance.

F. Disposal of Excavated Materials

1. Dispose of excavated material so that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of any facilities, or be detrimental to the completed work.

3.6 DISINFECTION

- A. After the hydrostatic and leakage tests have been completed, water pipes shall be disinfected in accordance with AWWA C651 and the regulations of the local health department.

- B. In general, one approved method referred to as "continuous feed method" is as follows:

1. Before being placed in service, all new mains shall be thoroughly flushed then chlorinated with not less than twenty-five (25) milligrams per liter of available chlorine.
2. Water from the existing distribution system or other source of supply shall be controlled so as to flow slowly into the newly laid pipeline during the application of chlorine.
3. The solution shall be retained in the pipeline for not less than twenty-four (24) hours and then flushed thoroughly with a potable water of satisfactory bacteriological quality before starting the sampling program.

- C. The contractor shall collect a minimum of two (2) samples from each sampling site for total coliform analysis. The number of sites depends on the amount of new construction but must include all dead-end lines, be representative of the water in the newly constructed mains and shall be collected a minimum of every 1,200 linear feet.

- D. Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating.

- E. These samples must be collected at least twenty-four (24) hours apart and must show the water line to be absent of total coliform bacteria.

- F. The chlorine residual must also be measured and reported.

- G. If the membrane filter method of analysis is used for the coliform analysis, non-coliform growth must also be reported.

- H. If the non-coliform growth is greater than eighty (80) colonies per one hundred (100) milliliters, the sample result is invalid and must be repeated.

- I. All samples must be analyzed by a State certified laboratory.

- J. The Owner and Engineer shall be provided copies of each report within 72 hours of the time the test was performed.

- K. SCDHEC only considers these tests valid for a 30-day period.

1. The Contractor is responsible for coordinating testing schedules with the Engineer and Utility in a manner to ensure that all associated closeout documentation (as-built drawings, easement plats, waiver of liens, etc.) can be finalized within 30 days of the tests.
2. The Engineer shall be given a minimum of one week for review of the tests.
3. All additional work, which is the result of expired tests, shall be performed by the Contractor at no additional cost to the Owner.

### 3.7 ACCEPTANCE OF PORTIONS OF THE WORK

- A. The Owner reserves the right to accept and use any portion of the work whenever it is considered to his interest to do so. The Engineer shall have power to direct on what line the Contractor shall work and the order thereof.

### 3.8 REMOVE AND REPLACE PAVEMENT

- A. Pavement shall only be removed after prior written authorization by the Owner. Pavement removed and replaced shall be done in accordance with the latest specifications of the State Department of Transportation. Traffic shall be maintained and controlled by means of flagmen as necessary.
- B. The edges of pavement shall be cut to a neat straight line with a masonry saw. The backfill shall be compacted and tested and a new pavement section provided as indicated on the drawings.

### 3.9 INSPECTIONS

- A. The Contractor shall give the Project Engineer or Project Representative a minimum of 72 hours notices prior to all required observations or tests.
- B. The Engineer will have the right to require that any portion of the work be done in his presence and if the work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled, and the Engineer fails to appear within 72 hours, the Contractor may proceed without him. All work done, and materials furnished shall be subject to review by the Engineer or the Project Representative, and all improper work shall be reconstructed, and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.
- C. The Engineer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed properly in accordance with the drawings and specifications.

### 3.10 TESTING

- A. General
  - 1. The testing laboratory, Engineer and Owner shall be given a minimum of 72 hours notice prior to all tests.
  - 2. All water line testing shall be made at the Contractor's expense. All compaction testing shall be made at the Owner's expense.
  - 3. Test results shall be furnished to the Contractor, Engineer and Owner within 72 hours after field tests are taken.
- B. Laboratory Testing
  - 1. Independent Testing laboratory shall operate in accordance with ASTM E 329 (latest edition) and shall be submitted to the engineer for approval.
  - 2. Laboratory testing for maximum density and optimum moisture content for subgrade and backfill shall be performed in accordance with ASTM D 1557 for general soil types or ASTM D 4253 or ASTM D 4254 for isolated cohesionless materials



3. Laboratory testing for mechanical analysis of subgrade and backfill shall be performed in accordance with ASTM D 2487.
4. Laboratory testing for plasticity index of subgrade and backfill shall be performed in accordance with ASTM D 4318
5. Frequency of laboratory testing
  - a. Native soil subgrade - One maximum density, optimum moisture content, mechanical analysis and plasticity index test for each material encountered that will serve as subgrade.
  - b. Fill/Backfill - One maximum density, optimum moisture content, mechanical analysis and plasticity index for each source and type of material to be used as backfill.

C. Field Testing

1. Independent Testing Laboratory shall prepare test reports that indicate test location, elevation data, and test results. The Owner, Engineer, and Contractor shall be provided copies of reports within 72 hours of the time the test was performed. In the event that any test performed fails to meet these specifications, the Owner, Engineer and Contractor shall be notified immediately by Independent Testing Laboratory. The Owner reserves the right to employ an Independent Testing Laboratory and to direct any testing that it may deem necessary. The Contractor shall provide free access to the site for testing activities.
2. Earthwork
  - a. Field density tests for in-place materials shall be performed in accordance with one of the following:
    - 1) Sand Cone Method - ASTM D 1556
    - 2) Balloon Method - ASTM D 2167
    - 3) Nuclear Method - ASTM D 2922
  - b. Frequency of field testing
    - 1) Subgrade for pipe bedding
      - a) One test per 100 linear feet of piping outside of pavement areas
      - b) One test per 30 linear feet of piping within pavement areas
    - 2) Backfill for pipe or appurtenance
      - a) One test per 100 linear feet of piping per lift outside of pavement areas
      - b) One test per 30 linear feet of piping per lift within pavement areas

D. Hydrostatic and Leakage Tests

1. The Engineer **must** witness and approve the following tests. The Engineer requires a minimum of 72 hours written notice prior to these tests.
2. The pipe shall be tested at 1.5 times the working pressure in accordance with AWWA C600, Section 4 - Hydrostatic Testing. However, in no case will test pressure be less than 150 psi. Allowable leakage shall not exceed that determined by the formulas:
  - a. Ductile Iron:
    - 1)  $L = SDP^{1/2} / 133,200$ , where L = allowable leakage (gal/hr)
    - 2) S = length of pipe tested (ft)
    - 3) D = nominal diameter of pipe (in)
    - 4) P = leakage test pressure (psig)

- b. PVC:
    - 1)  $L = NDP^{1/2} / 7,400$ , where L = allowable leakage (gal/hr)
    - 2) N = # of joints in pipe tested (ft)
    - 3) D = nominal diameter of pipe (in)
    - 4) P = leakage test pressure (psig)
  - 3. The test shall be conducted for at least two hours and a pressure of 150 psi shall be maintained during the test
  - 4. Should any test of the pipe laid disclose leakage greater than the above specified, the Contractor shall at his own expense, locate and repair the defective joints until leakage is within the specified allowance. The Contractor is responsible for notifying the Engineer 72 hours (minimum) prior to applying pressure for testing. Pressure test will be witnessed by the Engineer or his authorized representative.
- 3.11 ACCEPTANCE
- A. Final acceptance will be based on satisfactory materials, installation and construction of the specified work as approved by the Engineer. All construction shall be re-worked to the satisfaction of the Engineer until specified requirements are met.
  - B. All additional work, which is the result of a failed inspection, shall be performed by the Contractor at no additional cost to the Owner.

**END OF SECTION 33 11 00**